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ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXXIII. No. 3424 JULY 9, 1943 6d. WEEKLY

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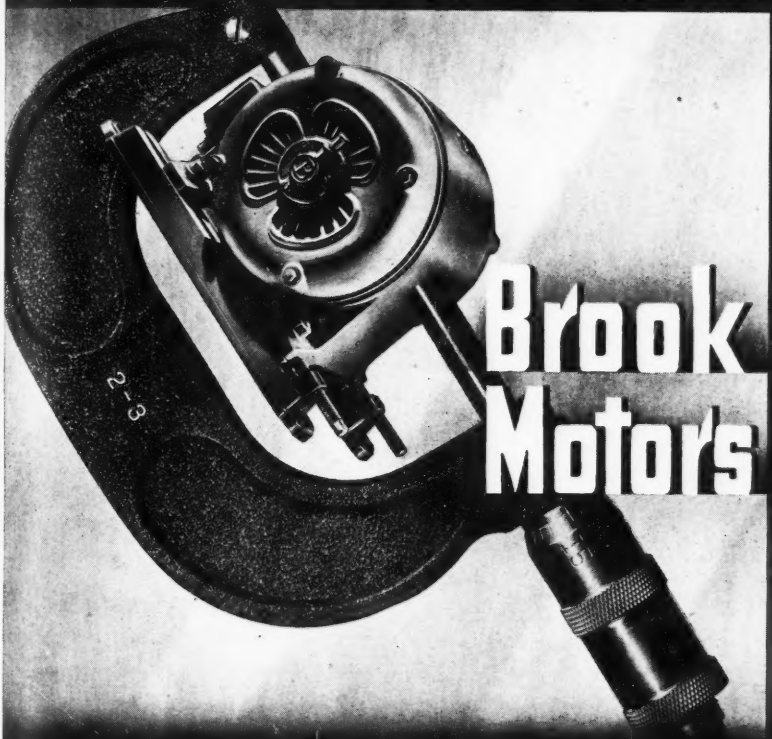

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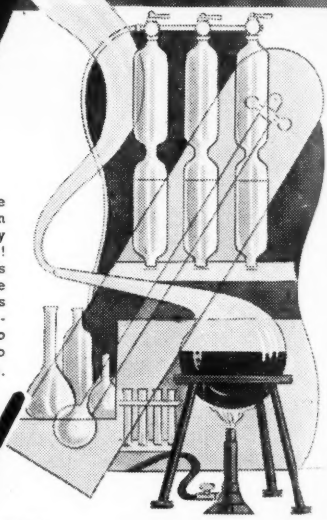

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ELECTRICAL REVIEW

July 9, 1943

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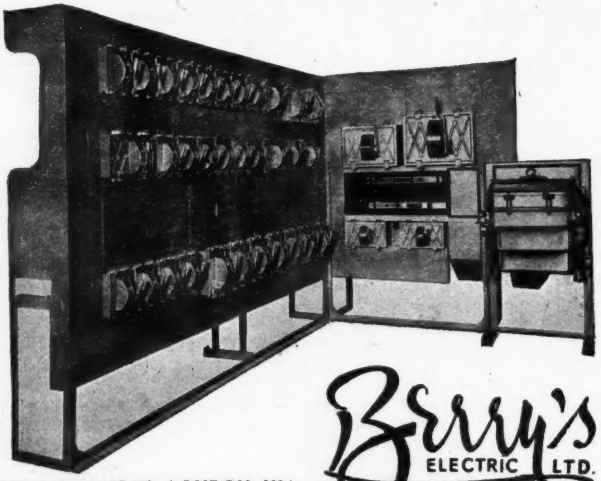

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXIII. No. 3424. JULY 9, 1943 6d. WEEKLY

The Work of E.D.A.

Wartime Activities : Preparations for Peace

WHATEVER reorganisation may take place in the electricity supply industry there should still be an Electrical Development Association or an organisation very closely resembling it. Even Government Departments have public relations sections—some of them of a considerable size and influence.

When we discussed the desirable qualifications of the prospective director of the Association a little while ago we insisted that he should not be a politician and that "as it is not E.D.A.'s business to attempt to reorganise the industry the Director should steer as clear as possible of those shoals."

Serving the Public

This seems to be recognised by those at present in charge of the Association's affairs and they also agree with the view that there is no need for haste in making the appointment. Inside E.D.A. there is no division between companies and local authorities. The sole consideration of the representatives of both parties is to increase and improve the service to the public. It is regrettable that such harmony should be confined to this aspect but that is another, and more complicated, story.

As evidence that the Association is not marking time until the advent of the new Director or until the end of the war, whichever may be the earlier date, a report on activities during April and May has just been sent to the members. Much of the work has been done for, or in conjunction with, various Ministries and thus the Government must now have a good idea of E.D.A.'s organisation and capabilities. Although a great part of these activities has necessarily been "disinterested" every legitimate opportunity has been seized to implant the electrical idea.

Professional Advice

The technical service to members has been kept up; in particular, advice on the maintenance of appliances which are hard to replace at present has been provided. It is proposed to set up a number of professional advisory panels; the first—architectural and building—has already been established.

But all the time there has been quiet preparation for the time when electrical development on a greater scale than ever before can be resumed. During this month "prestige" advertising will once again be seen in the national and local newspapers in order that the electricity supply industry shall be kept before the public's notice. In view of the activities of another industry this move is a wise one. Contacts with the public, and with other sections of the industry and with professional and trade industries are to be strengthened, notably by the establishment of an Electrical Information Bureau.

The Association is conscious of the fact that domestic electrical appliances, even under the best of hire and hire-purchase schemes, were not so cheap as could be desired and particular attention

is being devoted to this subject with a strong hope of favourable results. We may yet see the refrigerator business, for instance, put on a more satisfactory level.

Earlier in the war some members of the Association had doubts as to the necessity for the continuance of the Association during wartime, but that feeling has now generally vanished. The latest report entitles E.D.A. to claim that it has done remarkably well in unpropitious circumstances and members should feel that their money is being well laid out.

Pensions and Pay

WHEN a man has retired on pension and is called back to his job, or when he reaches pensionable age and is retained, should he receive both pay and pension? The matter is one which frequently crops up nowadays and in many cases a compromise is reached. Some municipal electricity supply authorities consider that it is too much that a man should, as they see it, be paid twice for his work, but it has to be remembered that if he went to work elsewhere his new employers would pay him the "rate for the job" regardless of his pension. Moreover, if the undertaking had to engage a new man it would have to give him a salary and still pay the superannuated man's pension to which, of course, he is legally entitled. In any event, income tax being what it is, the State takes a large share and so things are not quite what they seem.

Wartime Prices

AN American contemporary compares the 35 per cent. rise in food prices in the United States since the war in Europe started with the decrease of 2 per cent. in electricity charges. No statistics are available in this country to indicate the trend of electricity prices in relation to the general increase in the cost of living, but the position here can hardly be as favourable as in America, where the availability of water power has helped to keep down the fuel cost. Moreover, the impact of the war has not been felt to the same extent. Nevertheless, while a number of undertakings in this country have been forced by wartime circumstances to increase their charges, there have also been some notable examples of an opposite trend. In the past few months concessions have been announced at Guildford, Wimbledon, Reigate, Gainsborough, Oswestry, Witney and West Bromwich, and last week details were given of substantial reductions affecting consumers in an area of some 3,000 sq. miles in the Midlands. There is, be it remembered, no subsidy for electricity.

Meter Certification

The suspension of certification of meters referred to in this issue only means a reversion to the position as it was before the 1936 Act came into force. Earlier arrangements between undertakings and their consumers worked quite well on the whole and the type of skill released by the new Order will, no doubt, be employed to great advantage in many ways. Joint arrangements by undertakings for testing, mentioned in the official announcement, were always recommended by the Electricity Commissioners and are now more than ever desirable.

Contractors Carry On

THERE was a time earlier in the war when prospects for many electrical contractors seemed anything but rosy and members of the E.C.A. were urged to form local groups to carry on such business as was available and maintain the individual members' goodwill. So far as we are aware little has been done in this way and the reason seems to be that things have not turned out so badly as was feared. The *Electrical Contractor* says that it is "little short of astonishing to note the continued strength of E.C.A. membership. The number of business casualties among E.C.A. members is surprisingly small: even the number of 'suspensions for the duration' is modest in the extreme." This, says the *Contractor*, demonstrates that the installation trade, as represented by the E.C.A., is very much alive and determined to carry on to the end.

Food for Boilers

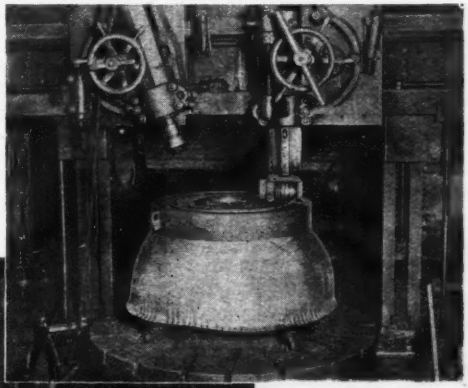
IT is a sad commentary on the present state of the world that in Argentina one of the large electricity supply companies reports that over a third of its output in 1942 was obtained by the burning of vegetable fuel—largely maize. This has necessitated the adaptation of existing boilers and the installation of special handling and storage equipment. Food for boilers gives food for thought, for this kind of thing is not a purely wartime phenomenon.

Pressing and Welding

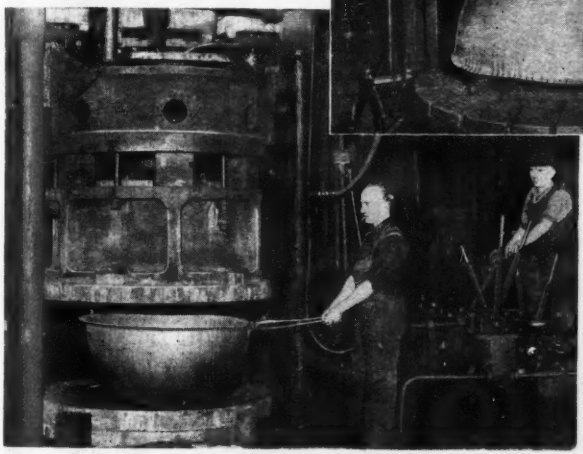
Heavy-Duty Operations on General-Purpose Machines in the Production of Sea-Mine Cases

THE main object of this article is to describe from the electrical aspect operations carried out by heavy-duty general-purpose pressing and welding equipment installed in a factory which we recently visited. But to widen the interest of the description the operations, with others, are linked with a particular product of the works —sea-mine cases. It should be borne in mind, however, that this is merely one of many products of the factory, and that there is little doubt that had some of the equipment been selected purely for work on the product in question, instead of for general-purpose work, it would have been different in some respects from that with which we are concerned.

The main components of the sea-mine case are the two hemispheres, the main body being produced in two sections. These are pressed out from circular blanks, each of which is cut from $\frac{3}{16}$-in. mild-steel plate about 5 ft. square. The plate is first marked out to a template of the required disc and then mounted between the two cutter wheels of rotary shears. The cutters are both driven by a 3-HP, 1,000-RPM squirrel-cage incorporated motor with push-button and contactor control. There is belt transmission up to the machine shaft from which sets of worm, bevel and pinion gears serve the cutter wheels. The very high ratio of speed reduction results in a complete cut of the 58-in. diameter disc in two minutes. The cutter heads are at the points of heavy vertical jaws which provide the necessary width clearance for the plate. The bottom head is fixed, but the top one is movable up and down by the agency of a sub-transmission provided by the same motor, by means of a clutch.



The obliquely disposed roller turns the lip out and the horizontally disposed one completes the downward rolling



Each hot blank is pressed to a hemisphere on a one-ton-per-sq.-in. hydraulic press with two movements—holding and pressing

In preparation for the hot pressing the circular blanks are heated in an oil- and gas-fired roller conveyor furnace. A 3-HP, 1,000-RPM s.c. motor serves the conveyor, with transmission first through a 250:1 ratio variable-speed gear box to a shaft from which there are a number of subsidiary transmissions, each through a worm reducing gear to a sprocket wheel from which a train of chains serves a group of four roller shafts. The result is that the work travels from end to end of the furnace in 15 min. A 10-HP motor-driven fan provides

the necessary blast for the furnace burners.

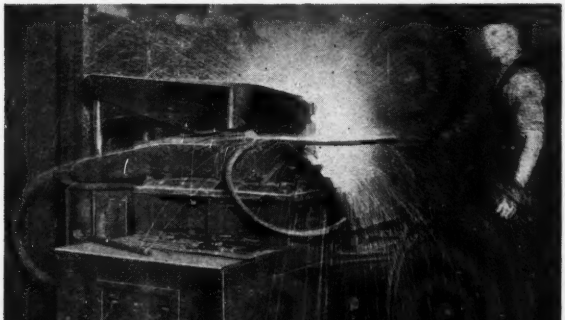
Each hot blank is now dealt with on a one-ton-per-sq.-in. hydraulic press which has two movements. The stationary die at the bottom is surrounded by a holding ring on which the hot blank is placed. Around the central ram carrying the punch at the top is a circular plate mounted on rams at the side of the press and carrying another holding ring similar to the stationary one. The top ring is first lowered on to the blank which is thus gripped between the two rings, and the central ram is next lowered so that the punch forces the blank into the die. As this last process proceeds the blank is drawn from between the clamping rings into the die. After raising the rams again the completed hemisphere pressing is pushed from the die by a hydraulic upward ejector.

As a preliminary operation to the production of a neck to be finally flanged at the centre of the hemisphere—top or bottom or both of the completed mine-case—a large hole is first cut at the centre of the hemisphere. This is done on a special skimming lathe which is driven by a 5-HP, 1,000-RPM s.c. motor with direct-on starting *via* push-button and contactor. In addition to belt and gearing, transmission is through two cone pulleys by which four speeds are afforded at the lathe shaft.

Back in the press shop again, the neck is pushed out where the hole has just been cut in the hemisphere, this being first applied to a specially constructed hearth on which the neck portion only is heated. The pressing is carried on a smaller hydraulic press by means of a die specially shaped for the purpose.

During the next operation of flanging on a special type of rolling machine a neck ring to which the mine cover is eventually bolted is slipped over the lip, the hemispheres being located on the table of the machine with the lip uppermost. A heavy containing ring is first placed over the neck, steel segments are then inserted in the containing ring and the neck ring is placed upon the segments in readiness for the rolling operations.

The neck ring is hot rolled edgewise on a machine on which the bending arm revolves about the former

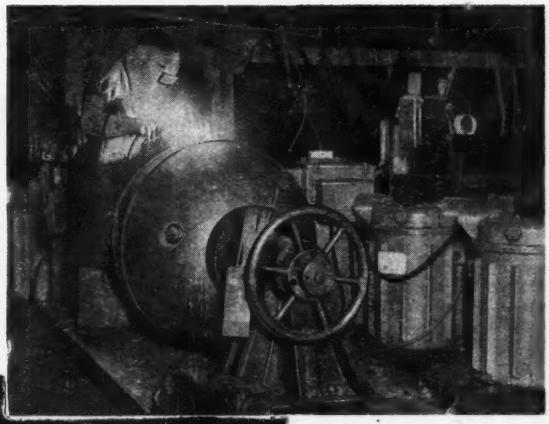


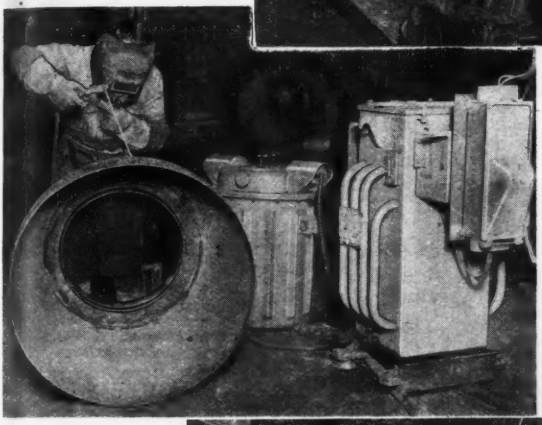
The two ends of the neck ring are butt welded on a resistance machine specially designed for this class of work

There are two downward pressing rollers on this machine. One, obliquely disposed, first turns the lip outwards, and the other, arranged horizontally, then completes the downward rolling of the lip on to the ring. On completion of the rolling the heavy ring is lifted off, when the segments fall away, leaving the neck ring securely "tied" by the neck lip, although it is finally tack welded to keep it in the correct position. This rolling machine has a 15-HP s.c. motor drive, transmission being first through a variable-speed gear box and then on to a crown wheel at the bottom of the table. The rollers are not independently driven, and down-pressure is applied to them by hand.

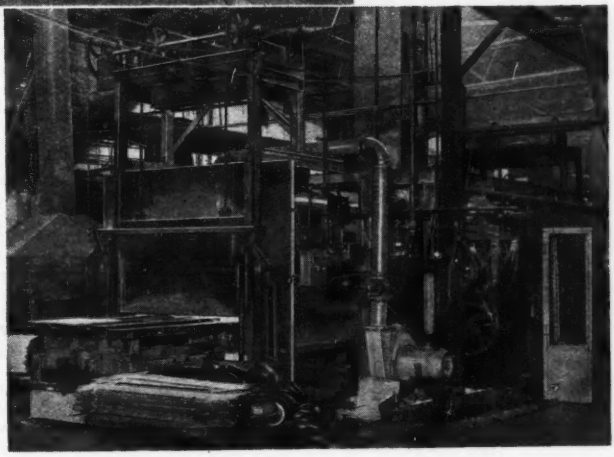
The neck ring is hot rolled edgewise in the horizontal plane on a ring-circling machine on which a horizontal bending arm with a roller at the end in line with a central former turns a hot bar on to the former. On completion of the ring, to save continuing the movement of the arm right round to the next starting position, the machine is operated in reverse for a few inches on the arm. A 3-HP, 1,000-RPM s.c. motor with push-button control *via* a reversing contactor transmits on to the bottom of the central shaft carrying the revolving arm, through bevel gearing. A complete circle of the arm is described in half a minute.

The two ends of the neck ring are now butt welded on an A1 resistance welding machine specially designed for this class of work. It has fixed and movable heads with jaw electrodes in which the ring is clamped, one on either side of the butt. When the welding current is switched on the movable head starts to close up, burning out a section of the ring as it does so. At a crucial point the remaining metal





Above: Two operators normally work on the band welding; one aside for photographing purposes. Left: For arc-welding lifting eyes to the work 250 A at 25 V is employed; transformer welding set with one regulator

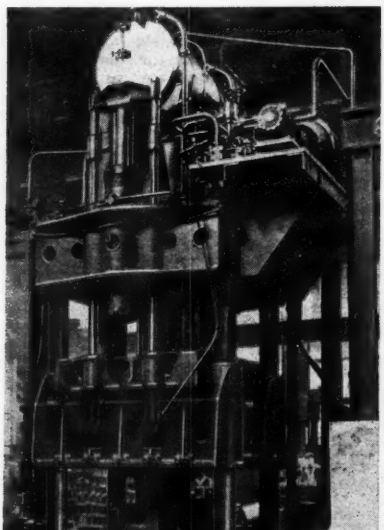


Blanks for the covers are first heated in a walking-beam furnace

reaches welding temperature, when a final bump up is imparted to the butt mechanically and the welding current is cut off. The work remains in this position until the clamps are removed, the ring is taken out and the machine is reset for the next start.

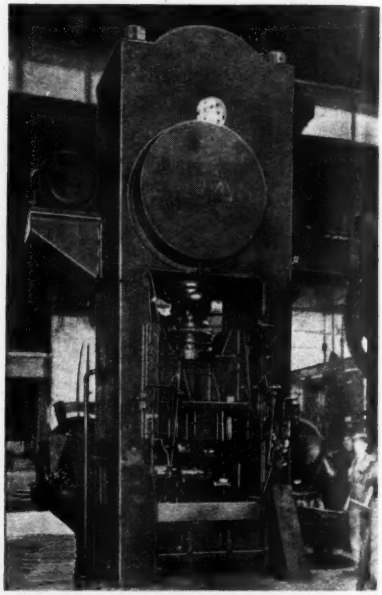
The whole sequence of operations is automatic, except for the removal of the work. The sequence is initiated by a foot switch. The clamps are compressed-air operated and the weld is completed in 15 sec. The welding current is provided by a 250-V (primary) transformer incorporated in the base of the machine. The actual welding current for this particular job is about 15,000 A at 5 V. The tools used in the clamps, and the secondary of the transformer, are water cooled. In the precise fitting of the correct tools for a particular job lies the successful operation of this machine.

Reversed so that the wide part is uppermost, the hemisphere is next placed on a special table which revolves in the horizontal plane while an oxy-acetylene cutter plays on the hemisphere to clean up the edge and reduce the work to the correct size. This table is driven by a 1-HP, 1,000-RPM s.c. motor through extremely wide ratio variable-speed reduction gears which afford table speeds down to as little as one revolution in 7½ min.



Actual pressing of the covers is carried out on a self-contained oil-hydraulic press with an incorporated 75-HP motor, pump and reservoir at the top

The two main arc-welding operations associated with this particular production are securing lifting eyes to the hemispheres and joining the two hemispheres to complete the sphere. For the first of these operations fixing jigs are used to secure the eyes to the pressing during welding. General-purpose $\frac{5}{16}$-in. mild-steel coated electrodes are used for this work, and the actual welding current is about 250 A at 25 V. For the second operation the two halves of the shell are assembled on a special rotary jig driven by a 1-HP, 750-RPM motor with transmission through a worm and gear train to give a speed to the work of one revolution in 8 min. A split steel band is first clamped over the join and tack welded. The ends of the band are next welded together, and finally, while the sphere is revolving, two welders, one on either side, weld the side edges of the band to the sphere, working at the same rate at which the jig revolves. Mild-steel $\frac{1}{4}$-in. coated electrodes are used for this dual operation, and the welding current for each point (operator) is about 450 A at 25 V.



Finally, the cover is both blanked and pierced on a purely electrically driven press

For these arc-welding operations several types of equipment are available, but the following are chiefly used, according to their availability in regard to other work which is

going on in the shops at the time. As is indicated by our two pictures, Philips AC transformer sets were employed at the time of our visit for both the operations described. Two transformer sizes are largely in use, to give maximum currents of 450 A and 250 A for each of two regulators. Either one or two regulators can be used in each case. The smaller regulator steps down from the maximum of 250 A to a minimum of 40 A in 15 steps. A set of the smaller capacity with one regulator is in use on lifting-eye welding and a set of the large size with two regulators is at work on the band welding. The reactor regulators can be used separately for two-point welding, or they can be connected in parallel to afford the maximum output for single-point welding.

Lincoln motor-generator sets for DC welding are also available, and they too will provide a maximum welding current of 450 A at 40 V. They incorporate resistance regulation. The third type of equipment is a Lincoln high-frequency rotary AC welding set. It is a simple motor-generator set with a three-phase motor directly coupled to a 200-cycle single-phase alternator, with a "variometer" current regulator. The output is 450 A at 50 V. We were told that high-frequency welding provides a very near approach to DC work in the smoothness of the operation.

The bands by which the two hemispheres are welded together are first made circular by passing them through a set of bending rolls. This has two driven rolls at the bottom and a "free" tension roll at the top. From a 5-HP motor there is belt transmission in two stages to fast and loose pulleys on the machine shaft from which there is final transmission through a gear train, giving an actual overall ratio of 1,000 RPM/10 RPM.

The covers which are bolted to the neck rings are hot pressed from square blanks which are first heated to about 900 deg. C. in an oil-fired conveyor furnace of the walking-beam type. The beam is driven by a 5-HP, 1,000-RPM s.c. motor which is mounted on an angle-iron structure at the side of the furnace. After transmission to a bank of countershafts, a gear train at the bottom serves a shaft running longitudinally along the whole length of the furnace. At about four points along the shaft there are bevel transmissions to cross crank shafts from which the walking motion of the beam is taken. Blast for the burners is provided by a 12-HP motor-blower.

Press Equipment

The actual pressing is carried out on a self-contained oil-hydraulic press on which an incorporated 75-HP s.c. motor serves the pump which is also carried on the machine. The oil is fed to the pump from an overhead reservoir, and the pump pressure directly operates on to the ram. Finally the cover is both blanked and pierced on a purely electrically driven press which is driven by a 40-HP s.c. two-speed 750/1,500-RPM motor bracket mounted high up on the machine. Transmission is through a train of gears on to a shaft carrying a cam which operates the ram. On high speed, blanking takes place at 16 strokes per minute, while eight strokes per minute is the low piercing speed.

All the hydraulic presses referred to in this article, except where otherwise stated, are served by the factory electrically driven hydraulic system, but in view of the interchangeability of the work on the actual equipments, and particularly because the operations described represent a very small part of the works capacity, we feel that to give details of the actual hydraulic plant would be either misleading or meaningless.

Industrial Research

OPENING the new physico-chemical laboratories of the British Coal Utilisation Research Association at Coombe Springs recently, Sir Edward Appleton, Secretary of the Department of Scientific and Industrial Research, declared that the steps taken by the Association were some of the first notable signs of a great forward movement in industrial research which he confidently expected would be one of the features of post-war Britain. It was, he said, fashionable nowadays to decry British industrial research effort because it was claimed that the amount of money spent per head of population was less than in certain other countries. Much depended, of course, on what basis such a calculation had been founded and there was, moreover, such a thing as unwise expenditure, as well as wise expenditure, even on research. But it could certainly be stated that our effort on research was not commensurate with our industrial needs. Furthermore, it was necessary to plan our attack on both new and old problems and, most important of all, to attract some of our best scientific brains to solve them.

It had also been stated that while this country had in the past been responsible for many of the most fundamental discoveries in science, other countries had often been the first to apply them to practical ends. When, however, the full story of our scientific and technical efforts during the war could be told our work in the application of science, as distinct from the accumulation of scientific facts, would be found second to none. He instanced radiolocation, which was not, as was commonly supposed, a new invention. Here a technique which had been developed by university scientists for purely scientific ends had been magnificently applied by young British scientific workers to practical wartime uses.

Red Cross Appeal

Latest Lists of Contributions

THERE has already been a good response to the reminder letter sent out about a fortnight ago and nearly forty more subscribers have come forward. Their names are given in the appended lists.

Tenth List

COVENANTED SUBSCRIPTIONS

	Gross Annual Amount £ s. d.
Brought forward	9,326 12 0
Pye, Ltd.	200 0 0
A. J. Balcombe, Ltd.	100 0 0
Frigidaire, Ltd.	52 10 0
City Electrical Co., Ltd.	21 0 0
Masteradio, Ltd.	21 0 0
Macfarlane Eng. Co., Ltd.	10 0 0
Hall & Stinson, Ltd.	4 4 0
J. C. Paton	4 4 0
Thomas Ness	2 2 0
Total	£9,741 12 0

DONATIONS

	£ s. d.
Brought forward	5,930 18 0
Newton Bros. (Derby), Ltd.	52 10 0
Lancashire Electric Power Co.	26 5 0
William McGeoch	25 0 0
Dumfries Electricity Dept.	10 10 0
Arrow Electric Switches, Ltd.	10 10 0
Pratt Bros., Edinburgh, Ltd.	10 0 0
A. F. Bulgin & Co.	5 5 0
Zenith Electric Co., Ltd.	5 5 0
Thomas Laurie & Co., Ltd.	5 0 0
Meed & Jeffery	2 0 0
Corrugated Packing Co.	2 2 0
I. H. Demood	1 1 0
Dartford & District Battery Service	1 1 0
Total	£6,087 7 0

Eleventh List

COVENANTED SUBSCRIPTIONS

	Gross Annual Amount £ s. d.
Brought forward	9,741 12 0
Automatic Coil Winder & Electrical Equipment Co., Ltd.	50 0 0
V. & E. Friedland, Ltd.	21 0 0
K. E. Beswick, Ltd.	10 10 0
Batley Electricity Department	10 0 0
Buxton & Longley, Ltd.	4 4 0
John Scott	3 0 0
A. T. Clarke	2 0 0
Total	£9,842 6 0

DONATIONS

	£ s. d.
Brought forward	£6,087 7 0
Heyes & Co., Ltd.	10 10 0
L. Robinson & Co., Ltd.	5 5 0
Pemberton & Dotchon	5 5 0
Multitone Electric Co., Ltd.	2 2 0
Mathews & Ryan	2 2 0
Redpath Radio	2 2 0
London Electric Firm	2 2 0
Agro Electrical Co., Ltd.	1 1 0
Total	£6,117 16 0

The organisers of the Appeal, have notified us of the following corrections:— First list (donation): "Borough Treasurer, Brighton" should read "Brighton Corporation Electricity Undertaking." Seventh list (covenant): Philips Lamps, Ltd., £500, should be included. Ninth list (donations): "W. Vaughan-Shaw" should read "Bristol Selectric Circle"; "H. Curtis" should read "Radio & Television Retailers' Association."

Meter Certification Suspended

UNDER Regulation 60CB—S.R. & O. 1943, No. 914, the certification of electricity meters will be suspended as from August 1st, 1943, but undertakings will still have to provide consumers with meters approved by the Board of Trade or the Electricity Commissioners. The Regulation does not affect the right of a consumer and also of the undertaking, in the case of meters to which Section 57 of the Schedule to the Electric Lighting (Clauses) Act, 1899 (or corresponding provision) applies, to have any dispute as to the condition or correct registration of such a meter determined by a meter examiner or, in the Administrative County of London, by an electric inspector. The obligations of undertakings under Section 2 of the Electricity Supply (Meters) Act, 1936, to provide and maintain apparatus for the testing of meters still stands.

The new Regulation will enable the Electricity Commissioners to release the remaining members of their meter examining staff, other than their chief meter examiner and one of the area meter examiners, who will determine disputes and deal with questions regarding the maintenance of testing apparatus by undertakings.

While it is assumed that undertakings will continue to test and calibrate their meters, they are urged to explore the possibility of joint testing with neighbouring undertakings or, where this is not practicable, of employing a larger proportion of women. Undertakings which have, or are likely to have, meters ready for certification will be able to arrange with the area meter examiners for their certification before the Order becomes operative if they notify them immediately.

The question as to what legislative action may be necessary later with regard to uncertified meters installed under the new Regulation will be considered when Section 3 (3) of the Electricity Supply (Meters) Act of 1936 (relating to the period for which meters may remain on circuit) is reviewed.

E.D.A. Activities

Ever-Increasing Volume of Work

THE extent to which the activities of the British Electrical Development Association are growing both in scope and quantity, apparently due to reactions to home and international affairs, is emphasised by an interim report just presented by the Council dealing with the work of only two months, April and May. Although the Association is rendering a great deal of service to Government Departments on any matters concerned with the electricity supply industry's contribution to the war effort, it is still able to keep abreast of problems affecting the utilisation of electricity after the war. It is doing this with a much depleted staff.

With a much-reduced staff, the British Electrical Development Association is doing an astonishing amount and variety of work both for present needs and with an eye to the future

Following a winter season of intense and urgent activity in connection with the Fuel Economy Campaign, E.D.A.'s collaboration with the Ministry of Fuel and Power during the months in question has been mainly concerned with long-term propaganda. Well over a million pieces of Ministry of Food literature have been supplied to date and over two hundred showrooms benefited by arrangements made with the Ministry to supply attractive window displays. Information on electric cooking equipment for all kinds of communal feeding purposes was provided for local authorities and factory owners, and close touch was kept with the Ministries of Food and Works in regard to supply of appliances and maintenance.

Services for New Houses

Comprehensive evidence from the point of view of electrical equipment was given to the Ministry of Health Committee on the design of houses and flats, while with regard to the Government's scheme for the erection of 3,000 farm workers' cottages an interim analysis shows that electrical service will be available immediately to a considerable proportion of the cottages for which sites have already been decided. Plans have been prepared for the wiring installations and appliances in experimental pre-fabricated houses to be erected at Coventry. The E.D.A. Electric Kitchen Planning Service has been reorganised in a preliminary way with special reference to probable post-war design.

Assistance has been given in the preparation of draft reports of the Electrical Installations, Heating and Ventilating, Mechanical Installations and Lighting Committees convened by the D.S.I.R. and Engineering Institutions for the Directorate of Post-War Building, while other aspects of post-war planning considered include railway electrification, lifts for low-cost flats, surveys of users' opinions and discussion with manufacturers regarding improved equipment.

With regard to appliance maintenance problems, difficulties in the supply of spare parts and material necessary for the upkeep of domestic cookers, kettles and other electrical appliances have been largely removed. Service to E.D.A. members has consisted of detailed advice on the rewinding of boiling plates, repair of switches, kettle elements, etc. The Cooker Technical Sub-Committee has completed proposals for dimensional standards of replacement parts with a view to interchangeability and lower maintenance cost. Proposals and recommendations on design of post-war cookers have been approved by the main committee and presented to manufacturers.

Subjects covered by technical queries included timber drying, Diesel engine warming, ultra-violet-ray sterilisation of milk bottles, load characteristics of welding plant, radio relay services, crematoria and home-made hovers. Following the production of a compact house service unit by the Mid-East England Area Committee, the views of members on this important problem are being surveyed.

The Association is helping in the re-establishment of an electrical section at the Building Centre, 23, Maddox Street, W.1, and attention is being paid to problems relating to the re-planning of Greater London. Steps have been taken to provide advice and instruction to staffs of canteens in which electrical equipment is installed. The Electrical Vehicle Association hopes to demonstrate a prototype national electric vehicle (see *Electrical Review*, June 4th, p. 742) to the Ministry of War Transport.

National Advertising

As a result of a recent report prepared it is proposed that a standing committee with the title E.D.A. Publicity Advisory Committee shall act in an advisory and consultative capacity in all matters appertaining to E.D.A. publicity and propaganda. A scheme of national "prestige" advertising is to commence this month. With a view to increased technical and commercial service a number of professional advisory panels is to be set up, the first, Architectural and Building, having already been formed. Other projects

include the establishment of a comprehensive Electrical Information Bureau, closer co-operation with other sections of the industry and with professional and trade interests, and fuller collaboration with national organisations seriously concerned with post-war and reconstruction problems.

Two noteworthy "extraneous" matters with which the Association has been concerned are the Electrical Industry Waste Paper Recovery Committee, which has secured the salvage of about 1,300 tons of paper, and the Electrical Industries Red Cross Appeal by which a total of approximately £15,000 has been collected.

New members enrolled include Shoreditch Borough Council, Bridgend U.D.C. and Doncaster Corporation.

Power Engineers' Notes

Small Salary Reduction

MEMBERS of the Electrical Power Engineers' Association have been notified that as from July 1st their salaries will be slightly lower owing to the operation of the cost-of-living adjustment system. The scale will revert to that which operated from October to December last and was reproduced in the *Electrical Review* of October 9th, 1942.

South Coast Sufferers

On account of the large-scale evacuations which have taken place during the war from a number of South Coast towns the supply undertakings in these towns have been placed in a lower class for the purpose of calculating the salaries of their staffs. The effect of this upon members of the Association was recently discussed by the National Executive Committee of the E.P.E.A. It was stated that in no case had the reduction been more than of one class and though the resultant decrease in salaries was regrettable the Committee did not feel that it was serious enough to justify any special action.

It was realised that war conditions operated in the other direction occasionally and some members had benefited by an upward re-classification of undertakings. It would therefore be inconsistent to contend that members of the staffs of "declassified" stations should not suffer reductions of salaries.

It was proposed that grants might be made from the Association's benevolent fund to the members affected but the Committee felt again that the adverse effects so far sustained did not justify any special treatment of this kind. It was decided that no action should be taken at the present time although the Committee expressed its willingness to consider the matter in the future should occasion arise.

Mains Engineer's Position

The National Joint Board of Employers and Members of Staff (Electricity Supply Industry) decided some months ago that the mains superintendent in the Newark-on-Trent undertaking should be allocated to Grade 4, Class D of the schedule. Against this it was contended by the Corporation that as about 65 per cent. of its output was taken by one consumer the mains superintendent had not the same responsibility as had corresponding officials in other undertakings of similar size. It proposed that the mains superintendent should be allocated to Grade 4, Class B. The Joint Board would not agree to this and subsequently the Corporation applied to the National Service Officer for permission to dispense with the official's services.

The matter was referred to the Ministry of Labour by whom it was passed on to the Electricity Commissioners who took the case before the Man-Power Consultative Committee. The Committee decided that the grading was appropriate for the duties carried out and recommended that the Commissioners should inform the Ministry that they were satisfied that for the purposes of the Corporation's undertaking it was necessary to have somebody for the position, and therefore the National Service Officer should not accede to the Corporation's request.

In giving this view, says the *Electrical Power Engineer*, the Commissioners were not, of course, expressing any opinion as to the appropriate grading for the post, but only on the necessity of the employee being retained in his present position.

Re-employment and Superannuation

The T.U.C. Advisory Committee, upon which the E.P.E.A. is represented has had under consideration the case of retired members of staffs who have returned to their professions. It was held that these men should be entitled to their superannuation allowances plus salary instead of, as was customary, receiving only an amount comprising pension and salary combined equivalent to their previous salary. In this connection the General Secretary of the E.P.E.A. has pointed out the advisability of members who have reached the age of 65 taking up work elsewhere than with a local authority if they wished to obtain maximum benefits.

N.J.B. and Non-Members

It has always been the view of the National and District Joint Boards that it was unfair that the machinery of conciliation should be utilised by those who were making no contributions to the upkeep of the Boards (*i.e.*, non-members of the E.P.E.A. or undertakings not parties to the Boards). Now, however, at the request of the Ministry of Labour the Boards have agreed to deal with cases involving non-members.

E.P.E.A. and Trades Councils

The local sections of the E.P.E.A. are to be authorised to affiliate to local trades councils and given a free hand to select those with which they desire to be connected.

Short-Circuit Analysis

Faults Between Two Phases

By T. F. Wall, D.Sc., M.I.E.E.

AMONG the most serious types of network disturbances in practice must be included short-circuits. These are generally due either to defective insulation or to voltage rises caused, for example, by atmospheric electrical storms. In a previous article*, the case was considered of the short-circuit of one phase to the neutral point and the resultant current and voltage relationships were derived by means of symmetrical components.

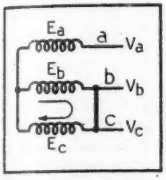


Fig. 1

In systems which have the star-point earthed, a breakdown of the insulation to earth of one phase will be a short-circuit of that phase. If the star-point is insulated, a breakdown to earth of one phase does not necessarily involve a short-circuit, but it does mean that the insulation of the other two phases becomes stressed to the line voltage instead of the phase voltage and this may cause a breakdown of these phases to earth. A short-circuit between two phases will frequently develop into a three-phase short-circuit—for example, if the short-circuit arc touches the overhead line of the healthy phase. A two-phase short-circuit in a three-phase cable will practically always develop into a three-phase short-circuit owing to the small distance between the phase conductors.

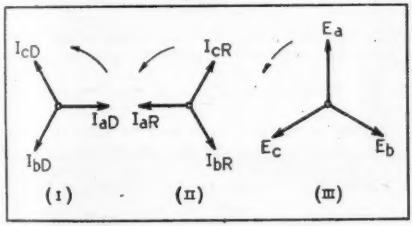


Fig. 2

When a short-circuit occurs between two phases it is necessary to distinguish between two separate cases, *viz.*, that in which the two lines are short-circuited (*e.g.*, both are earthed, but the star-point is insulated) and that in which the star-point is earthed and the insulation of two phases breaks down to earth. The condition for which two phases are shorted but no connection is established with the neutral point is shown in fig. 1. Using the same notation as in the previous article, the following three simultaneous equations may at once be written down:

$$\left.\begin{aligned} E_a &= V_a + j\,I_{aD}\,X_1 + j\,I_{aR}\,X_2 + j\,I_{ao}\,X_o \\ E_b &= V_b + j\,I_{bD}\,X_1 + j\,I_{bR}\,X_2 + j\,I_{bo}\,X_o \\ E_c &= V_c + j\,I_{cD}\,X_1 + j\,I_{cR}\,X_2 + j\,I_{co}\,X_o \end{aligned}\right\} \quad . . (1)$$

From fig. 1 it is seen that $I_b = -I_c$, so that $I_a + I_b + I_c = O$ and consequently† $I_{ao} = I_{bo} = I_{co} = O$. Since $I_{aD} + I_{aR} + I_{ao} = O$, it follows that $I_{aD} = -I_{aR}$ and this result defines the three-phase symmetrical current-vector diagrams for the two rotating systems, that is, fig. 2 (i) shows the direct-rotating symmetrical-current system and fig. 2 (ii) the inverse-rotating system. It is also seen from fig. 1 that $V_b = V_c$, so that the equations (1) $E_b - E_c = jX_1\,(I_{bD} - I_{cD}) + jX_2\,(I_{bR} - I_{cR})$. From this it follows that the vector diagram for the three-phase induced EMF vectors is as shown in fig. 2 (iii), and $E_b - E_c = -j\sqrt{3}\,E_a = j\,X_1\,(I_{bD} - I_{cD}) + j\,X_2\,(I_{bR} - I_{cR})$ . . . . . (2), so that the magnitude of the current vectors of fig. 2 is given by the equation

$$I_{aD} = \frac{E_a}{X_1 + X_2} \quad . . . . . (3).$$

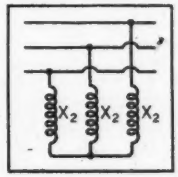


Fig. 3

This magnitude can be measured directly by connecting a symmetrical three-phase reactance X_2 as shown in fig. 3 and exciting the generator to develop the three-phase

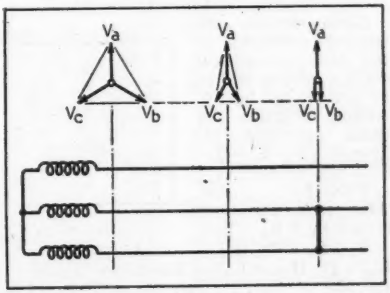


Fig. 4

* *Electrical Review*, February 26th, 1943.
† loc. cit.

induced EMF of magnitude E. The magnitude of the short-circuit current is then $I_b = I_c = \sqrt{3}\, I_{aD}$. Further, from equations (1) $V_a = E_a - jX_1 I_{aD} - jX_2 I_{aR}$, from which

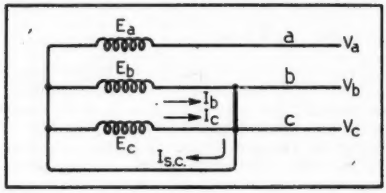


Fig. 5

the magnitude of the terminal voltage of the open phase of fig. 1 is found from the equation

$$V_a = \frac{2X_2}{X_1 + X_2} E_a \quad \ldots\ldots \quad (4).$$

Adding together the three equations (1) gives $V_a + V_b + V_c = O$, and consequently $V_b = V_c = -\frac{1}{2}V_a$ . . . . . (5), as shown in fig. 4.

The conditions for the second case are shown in fig. 5 in which the two phases *b* and *c* are short-circuited to the star-point. Since in

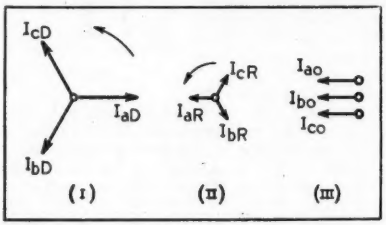


Fig. 6

this case $V_b = V_c = O$ the general equations (1) [see Case (i)] now become:

$$\left.\begin{aligned} E_a &= V_a + jX_1 I_{aD} + jX_2 I_{aR} + jX_o I_{ao} \\ E_b &= \quad jX_1 I_{bD} + jX_2 I_{bR} + jX_o I_{bo} \\ E_c &= \quad jX_1 I_{cD} + jX_2 I_{cR} + jX_o I_{co} \end{aligned}\right\} \ldots (6)$$

and, since the current in phase *a* is zero,

$$I_{aD} + I_{aR} + I_{ao} = O \quad \ldots \quad (7).$$

Consequently, the relative positions of the three symmetrical current systems will be as shown in fig. 6. Adding together the three equations (6) gives $E_a + E_b + E_c = O = V_a + 3jX_o$ so that, $V_a = -3\, jX_o\, I_{ao}$ . . . . (8). Also, from equations (6) and fig. 6 $E_b - E_c = -j\sqrt{3}\, E_a = jX_1 (I_{bD} - I_{cD}) + jX_2 (I_{bR} - I_{cR})$ so that $E_a = j\,(I_{aD}\, X_1 - I_{aR}\, X_2)$ . . . . . (9).

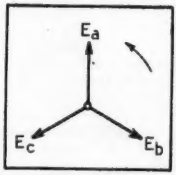


Fig. 7

Consequently, the relative position of the EMF vector diagram will be as shown in fig. 7. Also, from equations (6) and (8) $E_a = jX_1 I_{aD} + jX_2 I_{aR} - 2jX_o I_{ao}$ . . . (10) and from equations (10) and (7) $E_a = j(X_1 + 2X_o) I_{aD} + j(X_2 + 2X_o) I_{aR}$ . . . (11). Substituting for I_{aR} from (9) gives $E_a = j\left\{X_1 + \frac{X_o X_2}{X_o + X_2}\right\} I_{aD}$ . . . . . (12).

The magnitudes of the three symmetrical current components of fig. 6 will therefore be defined by

$$\left.\begin{aligned} I_{aD} &= \left\{\frac{X_o + X_2}{X_1X_2 + X_1X_o + X_2X_o}\right\} E_a \\ I_{aR} &= \left\{\frac{X_o}{X_1X_2 + X_1X_o + X_2X_o}\right\} E_a \\ I_{ao} &= \left\{\frac{X_2}{X_1X_2 + X_1X_o + X_2X_o}\right\} E_a \end{aligned}\right\} \ldots (13)$$

and the magnitude of the terminal voltage of phase *a* will be

$$V_a = \left\{\frac{3\, X_2\, X_o}{X_1X_2 + X_1X_o + X_2X_o}\right\} E_a \quad \ldots \quad (14).$$

The magnitude of the current which will

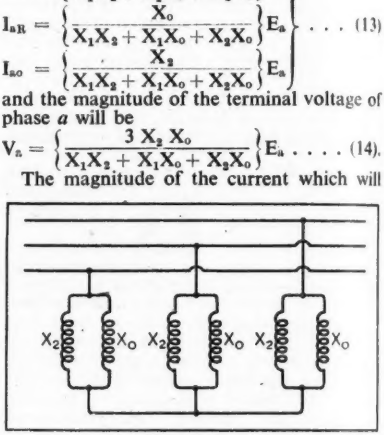


Fig. 8

flow between the short-circuited phases and the star-point will be given by $I_{sc} = I_b + I_c = 3\, j \frac{X_2}{X_1 X_2 + X_1 X_o + X_2 X_o} E_a$, that is, $I_{sc} = 3\, I_{ao}$ . . . . . (15). From equation (12) it will be seen that the magnitude of I_{aD} can be measured by means of the symmetrical load system connected at the point of short-circuit as shown in fig. 8.

French Electricity Restrictions

BECAUSE there has been a further drop in electricity production the Vichy Government has had to lower consumption levels and increase penalties for those who use too much electricity. In future low-voltage users who consume more than the authorised limit will have to pay a fine of one franc per kWh for the excess. If the limit is exceeded by 20 per cent. the supply may be cut off during the period necessary for compensation. If the offence is repeated within six months the supply will be cut off for 15 days, and if again repeated it will be cut off permanently. High-voltage users, according to their category, will have to pay fines of three, six or nine francs per kW of demand above the maximum. If the penalties slow up production or even shut down a firm the employer must continue to pay salaries.

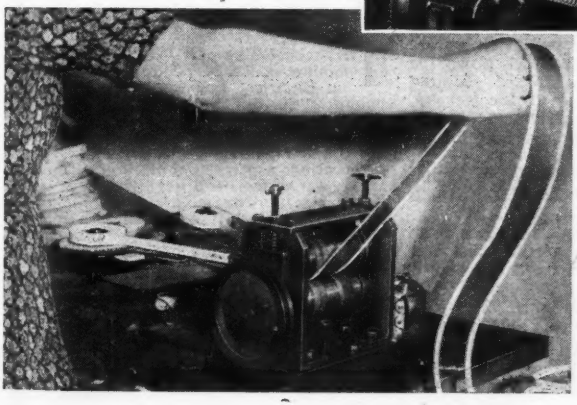
Making Airmen's Clothes

A Wartime Job for Electric Heater Makers

AN excellent example of the way electrical manufacturers are applying their specialised skill in the production of war equipment is furnished by the Dowsing Co. (Electrical Manufacturers), Ltd. In peacetime the company turned out electric heating equipment of all kinds, in particular apparatus for special purposes such as industrial irons for every conceivable trade, wax heaters, metal heating pots, etc., and it has now turned its attention to the manufacture, among other things, of electrically heated clothes for airmen. Actually this is not an innovation for the company since it has, off and on, been making this type of equipment since the last war. The scale of manufacture has, however, been enormously increased since the war began, separate factories having been established some distance from the original works to deal with heated clothing exclusively.

As all the heated waistcoats, gloves and socks produced in the works are made from start to finish, the company has become expert as tailors as well as electric heating engineers, and it has been told that its workmanship compares more than favourably with that of firms in the tailoring industry proper. This is probably due to the maintenance of a high standard of supervision and inspection in which, as engineers, the firm takes a pride.

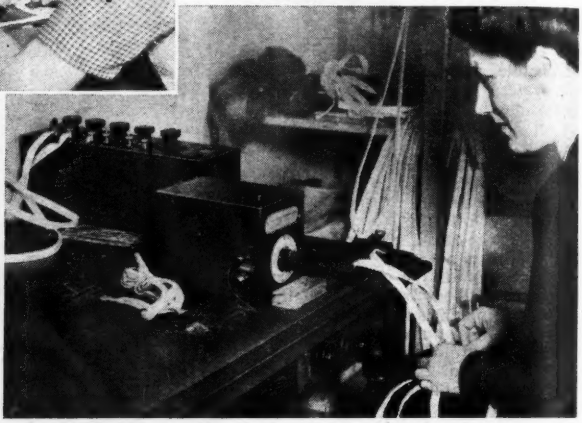
The process of manufacture is quite a complicated one, there being, for example, some hundred operations required to produce a waistcoat.



Cutting out garments (top), covering gauze for sock and glove elements (centre) and taping gauze elements (left).

Practically all of the work is carried out by machinery and recently both speed of manufacture and efficiency of the product have been increased by the adop-

tion of a new gauze element in place of the older spiral type. The latter, of 32 gauge high-tensile stainless steel, requires a special zig-zag stitch to fix it to the garment. The new gauze element, which is made of 43 gauge wire, can be attached by a normal stitch; moreover, it enables heating to be provided in the sleeves as well as the body of the waistcoat, which was not possible with the spiral type of element.



Attachment of elements to electrically heated socks (above) and bridging elements for correct electrical resistance (right).

Before being stitched on, the gauze elements are cut into strips of ½, 1½ or 2 inches, according to whether they are for socks or gloves, waistcoat sleeve or body. Tapes are stuck down each side and poplin covers are wrapped round them and stuck down the back. They are then cut to the required lengths (12–14 ft. in the case of the jackets), copper bonds are put on and stapled through, and the elements are bridge-tested for resistance.

The loading of the waistcoat is 54 W, and that of the gloves and socks 12 W in each case.

In the waistcoat, the leads are taken from the elements to terminals at the waist and connections are made with the dashboard of the aircraft by means of a detachable waist belt pad fitted with press studs. The connections, for which gauze with copper bonding is used, are such that, by changing the belt pad, it is possible to use the waistcoats on either 12 or 24 V circuits, while the circuits are arranged so that waistcoat, socks and gloves can be switched separately. It will be realised that the necessity for soldering has been very much reduced by the new design.

The waistcoats, which are made of fireproof poplin, are of surprisingly low weight and are designed for use in conjunction with float suits. Gloves consist of heated inners which are covered by detachable leather gauntlet outers for ease of writing. Socks are in the form of heated slippers which can be worn inside the normal boots. As already mentioned, waistcoats have heated sleeves and consequently the whole of the trunk and arms are protected.

Other specialised products of the company, manufactured for the R.A.F., are heaters for cameras, bomb sights, battery boxes and delicate instruments.

Electrical Glossary

THE concluding part (No. 7) of the revised edition of B.S.205, Glossary of Terms used in Electrical Engineering, has now been published (British Standards Institution, 2s.). Only the alphabetical index remains to be issued.

Part 7 begins with an entirely new section on Surge and Lightning Phenomena, dealing with such various aspects as protection of buildings and power systems and impulse-voltage testing. Another section on miscellaneous applications includes electric lifts and electric welding, in which the definitions have been brought into line with present practice. Subsections are devoted to X-rays and electro-medical practice.

Terms relating to telegraphy, telephony and radio, formerly dealt with in B.S.205 are now omitted, as they will be incorporated in a revised and much enlarged new edition of B.S.204, shortly to be published under the title of "Glossary of Terms used in Telecommunication."

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Electrical Power Engineers' Association has heard from the Colonial Office that the following members of the Association are interned at Singapore: Messrs. A. Bundy (charge engineer), A. T. Cameron (boiler house superintendent), D. Henderson (charge engineer), B. Murcott (meter superintendent), S. W. H. Parker (assistant meter superintendent), W. A. Phipps (district engineer), and P. C. Sands (district engineer), all in the service of the Singapore Municipality; Mr. G. Gray (charge engineer), Perak River Hydro-Electric Power Co.; and Mr. D. L. Morgan (assistant electrical engineer), Malayan Collieries, Ltd.

Mr. F. Forrest, M.Inst.C.E., M.I.Mech.E., M.I.E.E., chief engineer and manager of the Birmingham Corporation Electric Supply Department, is retiring in February next and **Mr. F. W. Lawton,** M.I.E.E., M.I.Mech.E., deputy chief engineer and manager, has been appointed to succeed him.

Mr. F. Forrest

Mr. F. W. Lawton

Mr. D. P. Sayers

Mr. Forrest, who has been with the Birmingham undertaking for thirty-seven years, received his education at elementary schools and at King's College, London, and served his apprenticeship with Siemens Bros. & Co., Ltd., at Woolwich. After a brief period as chief assistant engineer with the Tynemouth Electricity Department, he joined the Charing Cross Co., as assistant station engineer, remaining with that company for about four years. His association with the Birmingham undertaking commenced in 1906 when he was appointed substations engineer. In 1918 he became chief assistant engineer, and in 1930 city electrical engineer, in succession to the late Mr. R. A. Chattock, assuming the title of chief engineer and manager of the Electric Supply Department in 1936. Mr. Forrest was president of the I.M.E.A. for 1936-37, and was elected a member of the Council last year.

Mr. Lawton, who has also been with the Birmingham undertaking for many years, was educated at Audlem Grammar School and at Rutherford and Armstrong Colleges, and was apprenticed to C. A. Parsons & Co., Ltd., at their Heaton Works. He commenced his career in 1912 as mechanical assistant to the city electrical engineer, Stoke-on-Trent, joining the Birmingham Electric Supply Department two years later as assistant to the chief assistant constructional engineer. In 1930 he was appointed special technical assistant to Mr. Forrest and two years later became chief assistant engineer. He was appointed deputy chief engineer and manager in March, 1940. Mr. Lawton was awarded the Ayrton Premium by the I.E.E. in 1938 for his paper on "The Design and Operation of Hams Hall 'A' Power Station."

Mr. Lawton's position will be taken by **Mr. D. P. Sayers,** B.Sc. (Hons.), M.I.E.E., chief assistant engineer to the Sheffield Corporation Electricity Department. Mr. Sayers graduated at Birmingham University in 1923, and in 1924 joined British Insulated Cables, Ltd. In the same year he was appointed mains construction engineer to the Blackburn Corporation, and in 1928 became senior assistant to G. V. Twiss & Partners, being responsible for carrying out rural development schemes in various parts of the country. From 1930 to 1936 he was with Kennedy & Donkin, with whom he was engaged on C.E.B. work and in constructional work in connection with the Northern Ireland electricity scheme. Mr. Sayers joined the distribution department of the Sheffield electricity undertaking in 1936, and was appointed head of that department in 1938.

Mr. P. D. Tuckett has relinquished the position of chairman of the City of London Electric Lighting Co., Ltd., but is to remain on the board. The deputy-chairman, **Mr. A. E. Hadley,** is unable owing to the pressure of other business to take the chairmanship and **Mr. J. B. Braithwaite,** another director, is to succeed Mr. Tuckett.

Mr. G. F. Moore, chief engineer and manager of the Kirkcaldy municipal undertaking, has been recommended for the position of borough electrical engineer of Keighley in succession to **Mr. H. Webber** who is shortly retiring. There were 82 applicants for the post which carries an initial salary of £1,000 rising to £1,250 in five years.

Mr. Moore was born in Sheffield in 1906 and was educated at Leeds Central High School and Leeds University where he gained the B.Sc. degree. He received his mechanical and electrical training with Kitson & Co., locomotive engineers, Leeds, and the Yorkshire Electric Power Co. From 1929 to 1935 he was assistant mains engineer at Dundee and then for about two years was assistant mains superintendent at Carlisle. He became deputy electrical engineer at Kirkcaldy in 1936 and was appointed burgh electrical engineer and manager there in 1938. Mr. Moore is an associate member of the I.E.E.

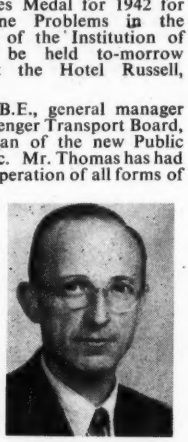
Mr. J. H. Martin, head cashier of the Bournemouth & Poole Electricity Supply Co., Ltd., for the past thirty-eight years, has retired on medical grounds at the age of 66.

The General Council of the British Institution of Radio Engineers has re-elected **Sir Louis Sterling** as president of the Institution for the year 1943-44, and **Mr. L. Grinstead,** M.I.E.E., has been elected chairman.

Mr. John Ayres, A.M.I.E.E., is to be presented with the Sir Henry Fildes Medal for 1942 for his essay on "Wartime Problems in the Factory" at a meeting of the Institution of Factory Managers to be held to-morrow evening (July 10th) at the Hotel Russell, London, W.C.

Mr. T. E. Thomas, C.B.E., general manager (operation), London Passenger Transport Board, has been elected chairman of the new Public Transport Association, Inc. Mr. Thomas has had a wide experience in the operation of all forms of surface transport. He entered the drawing office of the London United Tramways Co. in 1899 and later was engaged in electrification work under the late Sir Clifton Robinson, the managing director. He subsequently became resident district engineer and when the London United Tramways were absorbed by the Underground Group in 1910 he became commercial assistant. In 1917 Mr. Thomas was appointed development superintendent of the L.C.C. Tramways, becoming traffic manager in 1925 and general manager in 1930. He was appointed general manager of the L.P.T.B. Tramways in 1933, became general manager (road transport) in control of the Board's buses, trams and trolley buses in 1936, and three years later was appointed general manager (operation) in charge of both the railway and road transport operating departments. Mr. Thomas is a foundation member and gold medallist of the Institute of Transport and was president for the years 1939-41.

Mr. T. E. Thomas



Mr. E. D. Croft

Mr. S. Kennedy, director of Thomas Tilling, Ltd., and **Mr. J. S. Wills,** an executive director of the British Electric Traction Co., Ltd., are vice-chairmen of the Association, and **Mr. E. D. Croft,** secretary since 1939 of the Public Service Transport Association, which has been merged with the Omnibus Owners' Association to form the new association, has been appointed secretary. He has also been appointed secretary of the Conference of Omnibus Companies organisation, which elects employers' representatives on the National Council for the Omnibus Industry. Mr. Croft has also been nominated joint secretary of the employers' side of the National Council for the Omnibus Industry.

Mr. A. A. Rowse, M.I.Mech.E., M.Inst.C.E., M.I.A.E., M.I.E.E., whose election as chairman of Venner Time Switches, Ltd., was reported in our issue of June 18th, is well known from his connection with Morris Motors, Ltd. He became associated with Lord Nuffield (then Mr. W. R. Morris) in 1918 and was for fifteen years production director of the company. Subsequently he was responsible for the erection and production layout of one of the largest of the new aircraft factories. As chairman of Langley Alloys, Ltd., he has been identified with much pioneer work in the production of specialised bronzes for the electrical and aircraft industries. He is a director of Webley & Scott, Ltd., and also of Metal Castings, Ltd. During Mr. Leslie Burgin's period as Minister of Supply he acted as Controller of Machine Tools. Mr. Rowse is an honours graduate in engineering of Cambridge University.

The Institution of Electrical Engineers informs us that owing to the receipt of incorrect information the name of **Mr. P. W. Laverick** (associate member) was included in error in the list of deceased members in paragraph (6) of the annual report of the Council, on page 235 of the June issue of Part I of the *Journal*. Mr. Laverick is a director of Switchgear & Equipment, Ltd.

Among a list of awards to civilians for bravery issued last week we notice the name of Mr. **James Brittain,** a fitter with the Enfield Rolling Mills, Ltd., who receives the British Empire Medal.

Mr. A. E. Morgan, deputy borough electrical engineer at Barnes for the past four years, has been appointed borough electrical engineer and manager of Leyton.

Mr. A. E. Morgan

Mr. Morgan, who is 37, was educated at Crewe County Secondary School and at Hamburg University. In 1927 he was awarded a Manchester and District Armaments Scholarship in engineering and entered the Victoria University of Manchester, being awarded in 1930 a first-class honours degree in electrical engineering. He served an apprenticeship from 1923 to 1926 with the Metropolitan-Vickers Electrical Co., gaining experience in the manufacturing, erection, testing, drafting and selling departments.

He later served as junior draughtsman with the company and in 1930 obtained the position of assistant construction engineer with the North Wales Power Co., at Wrexham, later becoming technical assistant to the transmission engineer. In 1936 he went to West Ham Electricity Department as senior technical assistant to the distribution superintendent, which position he held until going to Barnes. He is an associate member of the Institutions of Mechanical and Electrical Engineers.

Alderman Sir Percival Bower (Birmingham) has resigned from the I.M.E.A. Council owing to the pressure of his other duties. **Councillor J. Selwyn-Jones** (Newton-le-Willows) has been elected hon. treasurer in his place. **Mr. E. E Hoadley** (Maidstone) remains hon. secretary.

At Birmingham University on Saturday last the honorary degree of Doctor of Law was conferred on **Sir Edward Appleton,** Secretary, Department of Scientific and Industrial Research.

Brigadier H. J. Lenton has been elected to the courts of Cable & Wireless (Holding), Ltd., and Cable & Wireless, Ltd., and the boards of their associated companies, with the title of "director resident in South Africa." Brigadier Lenton recently retired from the Postmaster-Generalship of the Union of South Africa, having held that office since 1926. He represented the Union of South Africa at the Imperial Wireless and Cable Conference in London in 1928.

Mr. F. C. Gill, Bradford, has been chosen for the position of technical assistant (distribution), Chesterfield.

I.E.E. Awards.—The Council of the Institution of Electrical Engineers has awarded the following premiums for students' papers for the session 1942-43:—Students' premiums (value £10): Messrs. F. Ashworth (Northwich, Cheshire), M. A. Tucker (Norton-on-Tees, co. Durham), and C. R. Young (Rugby). Students' premiums (value £5): Messrs. G. M. Childs (London), D. H. Coles (Manchester), A. S. Hill (Runcorn, Cheshire), B. R. Horsfield (Leeds), L. Kiernan (Southport, Lancs), W. Paterson (Glasgow), T. E. A. Verity (Liverpool), C. W. Westwood (Birmingham), L. C. Hall (Chester), and Dr. T. W. Hunt (Birkenhead).

Mr. L. J. Restall, a director, has been appointed managing director and secretary of the Union Lamp & Lighting Co., Ltd., for the duration of hostilities.

Mr. W. T. Maccall, M.Sc., M.I.E.E., head of the Electrical Engineering Department of Sunderland Technical College since 1909, has tendered his resignation to take effect in August. It is proposed to advertise the vacancy at £600 rising to £700.

Mr. Maccall, who is sixty-four, was educated at Sedbergh School and Owens College, Manchester, and received his practical training with Hans Renold & Co., and W. T. Glover & Co. From 1902 to 1904 he was a demonstrator at Owens College and for the next four years lecturer in engineering at the Woolwich Polytechnic. He was appointed head of the Department of Electrical Engineering and Physics at the Halifax Municipal Technical College in 1908 and in the following year went to Sunderland. Mr. Maccall was chairman of the North-Eastern Centre of the I.E.E. in 1924-25. He is the author of three well-known works on electrical engineering.

Mr. D. P. Morton, a director of Berry's Electric, Ltd., retired on June 30th, after forty-five years' service with the company. Mr. Morton will be remembered by numerous friends in the electrical industry from the time when the head offices of the company (then Berry Skinner & Co.) were at Upper Thames Street, E.C., under the managing directorship of the late Mr. Herbert H. Berry. Mr. Morton was director and secretary to the private company till 1928, and a director of the new limited company when it was formed in that year. A visit to a West End show and a farewell party at the Café Royal were arranged by the company, and a presentation by the directors and staff of all branches was made to Mr. Morton by the managing director, Mr. G. J. Berry. Mr. Morton will remain on the board of the company for the time being.

The Liverpool Corporation Finance Committee has appointed a special committee to consider what steps should be taken to fill important executive positions owing to the present holders having reached, or will shortly reach, the retiring age. One of these offices is that of city electrical engineer. The position of deputy electrical engineer has been vacant since **Mr. H. Pryce-Jones** left to become borough electrical engineer of Brighton.

Councillor A. Kenworthy, A.M.I.E.E., who has been made a J.P. for the West Riding of Yorkshire, is on the staff of the Barugh station of the Yorkshire Electric Power Co. He was formerly at Sheffield.

Obituary

Mr. W. P. Digby.—We regret to learn of the death on July 5th of Mr. William Pollard Digby, the well-known consultant; he was sixty-seven years of age. Mr. Digby was born in Colombo, Ceylon. He was educated at the Guildhall School, Bury St. Edmunds, and at the Crystal Palace School of Engineering and was a pupil at the Newton Electrical Works, Taunton. After holding various positions he commenced inspection and research work in Westminster in 1904 and he was the senior partner in W. P. Digby & Partners, consulting engineers. He acted for many years as consulting engineer to the Pahang Consolidated Co., Ltd., Federated Malay States.

Mr. Digby was a member of the Institutions of Electrical and Mechanical Engineers and of the Iron and Steel Institute and contributed papers to the proceedings of these bodies, the Institution of Constructional Engineers, the British Association, the Royal Society of Arts, etc. He leaves a son and a daughter.

Mr. Peter Clark Gill, electrical transmission and distribution superintendent of the British Columbia Electric Railway Co., Ltd., died recently. He joined the company in 1910 as assistant in the electrical department at the Vancouver office. In 1914 he became distribution engineer, receiving his appointment as superintendent in charge of construction and maintenance of all overhead and underground power circuits throughout the company's lower mainland system in 1929.

The late Mr. Peter Clark Gill

Mr. S. Flint.—The death is reported, at the age of ninety-three, of Mr. Samuel Flint, O.B.E., J.P., a former alderman of Leicester. Mr. Flint had been chairman of the Leicester Tramways and Electricity Committees and was president of the Municipal Tramways Association in 1918.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Planning Rural Development

NOW that the war situation looks a little brighter, the electricity supply industry might reasonably look ahead to provide schemes which could be put in hand immediately on the cessation of hostilities as a partial means of avoiding the unemployment which followed the last war. Here is a suggestion on which it would be interesting to have your readers' views.

Many properties, especially in the rural districts, have not yet got a supply, for the simple reason that owing to their isolated positions it has not paid anyone to supply them. I suggest that the Electricity Commission by means of a levy on electricity supply revenue accumulate a fund to be distributed in grants or loans according to the districts to be developed. In some very "thin" districts it would have to take the form of a grant free of interest as the revenue would no more than meet maintenance and working expenses. Slightly better districts could stand a loan at 1 per cent. or, better still, at 2 or 3 per cent.

Undertakings should be invited to submit schemes for their undeveloped districts with an estimate of financial results, the Commissioners to allocate grants or loans accordingly. We might then all be ready to move off and so avoid a waiting period after the end of the war.

Ashford, Kent. H. WILSON,
Chief Electrical Engineer,
Ashford U.D.C.

Standard Electric Vehicles

THE suggestion made by Mr. C. Heys in his letter in your issue of June 18th could not be worked unless a standard battery were available, as the depots, garages or other places where vehicles are to pick up energy could not be expected to keep ready charged the multiplicity of sizes and shapes of batteries required to replace those now carried.

The standard battery I have been advocating for the last two years would, however, fit many of the vehicles now on the road and most new electrics could easily be constructed to suit it. Every standard battery would be alike in its attachment features and also in the space taken up. It would contain twenty cells and would give over 300 cycles of 10,000 Wh for £35, if cells were of Continental type, or approximately 900 cycles of 6,680 Wh for £68 if heavy type cells go in.

Obviously any battery makers could turn these out, and standard batteries of any brand would run any electric vehicle built to take them just as any petrol vehicle will run on petrol of any brand. A good case could be made for the use of the best quality in each instance.

I have recently been exploring the possibility of using the standard battery on types of electric vehicles other than the straight commercial type. I first found the standards suitable for six pay loads in vans and lorries of from ¼ to 3 tons. I now find that one standard battery will fit and power low- and high-platform, elevating and tiering trucks and give rather better than usual results.

I find that two standard batteries will power a four-seater private car (using existing modern steel-body dies) at approximately 30 MPH for over 60 miles, and that tractors of from 4 to 10 tons can be fitted with two to four batteries quite easily and give better performance than with battery schemes as used in the past.

All this seems to show that your correspondent's scheme could be carried out, but it must provide for a standard battery and not a standard vehicle.

Ormskirk. H. N. OUTRAM

Technical Education

A RECENTLY published pamphlet entitled "Britain Needs a National Policy of Technical Education," by "A Student of Britain's Future." (Pp. 32. Sir Isaac Pitman & Sons, Ltd.), takes half an hour to read and 6d. to buy. The small expenditure of time and money is well worth while for anyone concerned with our post-war status as a nation. And who is not? The anonymous author points out that our survival as a great power will depend on our manufacture of high-class goods in large quantities, and that this in turn will necessitate both a greater amount and a higher standard of technical education for all classes, from the artisan upwards. The inadequacy of the training received by our technicians in the past is illustrated by striking statistics.

The alarming shortage of skilled workers our war needs revealed is but one pointer. Vocational training in the sense of direct preparation for a single occupation, though adequate for immediate war needs, is deprecated in the pamphlet for peacetime requirements, and a rounded education is advocated instead, which should include the cultural, the civic, and the vocational aspects of life. Adolescent education for wage earners is a part of the author's scheme, and he mentions the interesting fact that an inquiry made in three factories showed that the cost of releasing all the juvenile employees for a full half week, would be only 2 per cent. of the total wages bill, and 1 per cent. of the total cost of production.—R.O.K.

Insulating Oils

Causes of Deterioration in Service

By C. H. Pike, Grad.I.E.E.

Effects of moisture and impurities and of oxidation of switch and transformer oils are surveyed and the means of guarding against them or rectifying them are set out

IMPURITIES are always found in new oils. The most important of these are the asphaltenes left as a residue during distillation owing to incomplete separation from the hydrocarbon oils formed by the distillate. The inherent impurities are polar substances, to which conductivity of oil is due, but they exercise a negligible effect on stability over a long period of service. Serious loss of quality results from acquiring moisture and solid matter and absorbing atmospheric oxygen.

As little as 0·01 per cent. of moisture reduces the breakdown voltage of clean oil by from 20 to 30 per cent. even when it is free of solid impurities, which may be present either as fibres and dispersed particles of microscopic size or as a colloidal suspension of sub-microscopic particles. The effect of relatively large particles, though appreciable, may not be critical in the absence of water. For instance, cotton or pressboard fibres alone reduce the breakdown value by about 30 and 20 per cent., respectively, but water and fibres in conjunction may reduce it by 90 per cent., mostly due to the first 20 or 30 mg. of fibre per 10,000 c.c. of oil.

Suspended and Deposited Carbon

A certain amount of carbon is always present in the oil of circuit-breakers and on-load tap-changers. Part of it settles on the mechanism and insulators—particularly the horizontal surfaces—and at the bottom of the tank, while the remainder is in suspension. The suspended carbon has little influence on the electric strength of the oil, but the deposited material may provide a creepage path on insulators. In the presence of water fairly large carbon particles may reduce the electric strength.

Moisture, fibres, dirt and carbon do not in general cause chemical deterioration. The bulk of these impurities can be removed by treatment and the electric strength of the oil restored. The quality of circuit-breaker oil, however, when badly carbonised due to the interruption of heavy currents, has usually deteriorated—as the result of cracking—to an extent which makes it useless. The most serious cause of deterioration in normal service is the combination of atmospheric oxygen with certain constituents of the oil, and the length of satisfactory service obtainable depends on the degree to which oxidation can be prevented or retarded. The effects of oxidation are dependent upon the character of its products rather than upon their quantity. An oil may become quite unserviceable when the proportion by weight oxidised is but a few tenths of one per cent. Generally, oxidation proceeds at a greater rate in transformers than in switchgear by reason of the higher operating temperatures (the rate of chemical reaction is doubled with each 10 deg. C. rise) and, usually, the wider temperature variations caused by the load cycle (oxygen is absorbed due to inspiration with falling temperature). Rate of oxidation also depends on the area of oil in contact with the atmosphere.

The initial products of oxidation consist mainly of organic acids and water plus minor quantities of other substances. Later, further products of oxidation combine with certain of the earlier-formed products or else unsaturated hydrocarbons originally present in the oil combine together to form solid products. These have a limited solubility and become evident as a deposit (sludge) as soon as the quantity present exceeds that which can be held in solution, an amount which decreases with temperature.

Of the initially formed oxidation products the most chemically active are peroxides, which are strong oxidising agents, and strongly corrosive low - molecular - weight acids. Both can react with metals used in transformer construction to produce metallic soaps (saponification) and they accelerate oxidation. When their limit of solubility has been reached, they appear as a sediment together with the true sludge. Acidic products of oxidation cause a "tendering" or reduction in mechanical strength of cellulose insulation, leading to failure when windings are liable to be subjected to mechanical stresses.

Restricted Oil Circulation

Some products of oxidation have little effect on the electrical properties of oil in the absence of water. Oil-soluble solids of high molecular weight increase the viscosity of the oil, adversely affecting its cooling function. Sludge is a poor thermal conductor and impedes heat dissipation. This, together with the blocking of oil ducts

and passages, restricts oil circulation, thus causing increased temperature.

Development of acidity precedes both the loss of insulating properties of the oil and the deposition of sludge, but the latter is not stable and can be split up by heat into acid and other products of lower molecular weight, some of which may even be volatile.

Oxidation products do not, in general, appear to lower the electric strength appreciably, though there is a marked increase in conductivity with deterioration. As a result of the volatility of low - molecular - weight acids and other products, gas pockets may be formed in which ionisation may lead to local arcing. From the adjacent oil more gases—principally hydrogen, acetylene and methane—are generated so that a cumulative deterioration occurs. Even in good oil electrical discharge in voids initially present or formed subsequently in either the solid or liquid insulation can cause deterioration. Hydrogen, acetylene and other hydrocarbons and solid polymerised products are formed.

Cracking of Oil

Persistent discharge causes cumulative deterioration and, in some cases, serious cracking of the oil. The production of gases inflammable in air may give rise to an explosive mixture when the gas bubbles reach the surface of the oil. Cracking is usually the result of a limited but sustained fault, but it can be caused by bad contact in circuit-breakers or tap-changers, or by transformer core bolts or laminations with faulty insulation.

Preferably, the quality of oil should be maintained by avoiding causes of contamination and deterioration rather than by restorative treatment. When dust- and water-tight construction is not practicable, condensation must be prevented through heating and ventilation, especially in the case of switchgear when no transformers are in the same compartment. Indoor-type transformers can be kept fairly dust- and water-tight by maintaining the gaskets in good condition, but when a breather is not fitted effective sealing permits only extremely limited breathing and internal corrosion may develop because volatile products of oxidation cannot easily escape. Stagnant and corroded air above the oil probably increases the rate of deterioration, and it may be advantageous to arrange vents on transformers without breathers, even if these allow the ingress of a certain amount of moisture and dirt. Breathers, in addition to preventing the ingress of moisture, absorb volatile products of oil deterioration.

With conservator-type transformers serious loss of oil quality due to the ingress of moisture, dirt and air is notably infrequent. The small surface area of the conservator and the comparatively low temperature of the oil effectively minimise the oxidation rate, as this depends on the area of oil surface exposed to inspired atmosphere and on the temperature. Any moisture or dirt breathed in due to the temperature cycle is trapped in the conservator where it is not subjected to electric stress. Moisture can be drained off periodically. Owing to the oil in the main tank being under a static head from the conservator the ingress of rain or condensed moisture is prevented.

Hermetic sealing of transformers after the expulsion of all air is the logical method of preventing loss of oil quality. Various types of sealed units are available, for limited outputs, which are completely oil-filled, change of volume with temperature being accommodated by some form of expansion chamber. A method likely to become more common consists of maintaining a dry-gas cushion above the oil. By using an inert gas, such as nitrogen, in a hermetically sealed transformer with an expansion device or by maintaining a slow trickle of nitrogen through the unit, deterioration of oil is practically eliminated.

The exclusion of atmospheric oxygen has the minor advantage of preventing the ingress of foreign matter, but since this can be largely removed by treatment the important consideration is the prevention or maximum retardation of deterioration. Sludge resulting from acidity can be removed, but once sludging has commenced it will continue after the oil has been purified. Maintenance methods of purification do not remove the deterioration products that are in process of formation but have not yet been precipitated. No economic maintenance method is yet available for restoring acid oil to its original quality. Acid oil should be stored until a sufficient quantity for treatment at a refinery has accumulated.

Electric Earthquakes

IN the House of Commons last week, Mr. Purbrick asked the Lord President of the Council whether he would investigate the application in America where, by a neutraliser, man-made electrical disturbance more powerful than the greatest storms of thunder and lightning could be reduced to a whisper, and in one test a 25,000-V spark was projected directly to a wireless receiving set; and would he consider the applicability of this method for the artificial promotion of seismic disturbances, volcanic eruptions, etc.

Mr. A. S. L. Young, who replied, said that further information about this device was being sought from the appropriate scientific authorities in the United States of America. When this was received the potential applications of the device would be fully examined. The Lord President was, however, advised that any device which was designed for the reception of radio waves in the presence of electrical noise was unlikely to be of use as a generator of seismic or volcanic disturbances.

COMMERCE and INDUSTRY

Restrictions on Welding Plant. E. A. W. Display.

Welders at Worthing

REPORTING recently upon an application for the installation of electric welding plant at a local factory, the Worthing borough electrical engineer referred to the characteristics of a single-phase welder which represented a very intermittent load and caused fluctuation of supply voltage, to the detriment of the general body of consumers. In view of the fact that electric welding was rapidly being adopted, particularly by garages, the Electricity Committee would no doubt think it desirable to protect the consumers in Worthing, which is largely residential, from the irritating effect of flickering lights and noisy radio. A stand must now be made to achieve this end whilst there were only a few welders in the district.

The Committee decided that any proposal to connect an electric welder to the mains, whatever its type, must be by special application, stating clearly the type, rating and voltage of the welder. On the medium-voltage supply, single-phase welders rated higher than 5 kVA must be wound for 400 V and connected between two phases. The tariff for single-phase unbalanced-load welders would be a flat rate of 2½d. per kWh. When supply was taken on the two-part business tariff with an adjustment for horse-power of motors, the welder charge would be £3 10s. per kVA of maximum rating. The apparatus must not be used in such a manner as to cause interference with the supply to other consumers.

I.M.E.A. Appointment

The Incorporated Municipal Electrical Association is inviting applications by July 26th for the position of acting assistant secretary (male or female) for the duration of the war. A maximum salary of £500 is offered and applicants are required to have had experience in attending meetings and preparing reports and a knowledge of journalism.

E.A.W. Exhibition for the A.T.S.

In order to demonstrate to members of the A.T.S. how electricity is produced and how widespread are its uses in everyday life, particularly in the home, the Electrical Association for Women has prepared a portable photographic exhibition which will be distributed to units in all Commands by the Army Bureau of Current Affairs ("ABCA"). The exhibition comprises fourteen separate panels each measuring 2 ft. by 3 ft. and together presenting about seventy photographs. The first panel, making use of the E.A.W. charts, shows clearly how electricity is generated, the second how a domestic installation is arranged. The labour-saving, convenience and comfort features of electrical apparatus that can be employed in the home are then stressed, and the theme passes on to agriculture, transport, telecommunications and the general versatility of electricity.

A more personal approach is adopted in a panel on "Careers" which indicates how electricity offers interesting possibilities to the educated woman who is prepared to study. Special wartime pictures show women doing actual jobs including repairs to electrical domestic appliances, maintenance of blacked-out street lighting, meter testing, etc.

Electrical Whitley Councils

The setting up of a Whitley works council for the electricity undertaking was raised at a meeting of the Blackburn Town Council on July 1st. Alderman C. A. Critchley, chairman of the Electricity Committee, said that inquiries had been made of 23 different towns, and in only six were such councils in existence. In one case a council formed in 1921 had not met since, while another, formed in 1937, had not met since 1939. There did not seem to be much urgency about it. A move forward would be made after further inquiries.

Warning to Retailers

Some time ago the Central Price Regulation Committee issued a warning to retailers against buying through any but the recognised channels, lest by so doing they failed to obtain proper invoices for their stocks and thereby offended under the Invoices Orders. In repeating this warning, the Committee also points out that retailers should see that where purchase tax is payable the actual amount paid is stated as a separate item in the invoice. If this is not done the retailer may find himself unable to price his goods in accordance with the regulations made under the Goods and Services (Price Control) Acts and thus render himself liable to prosecution. This particularly applies to retailers governed by Orders controlling their selling price by permitting a fixed percentage to be added to their cost price *exclusive* of purchase tax.

Electricity Reorganisation

In connection with the proposal of the London and Home Counties Joint Electricity Authority for the co-ordination of electricity undertakings in the London District, the Guildford Corporation Electricity Committee suggests that every step should be taken by the Council to oppose the proposals *in toto* and stand firmly by the principle of local government ownership and administration of electricity undertakings and urge the Government to refrain from putting into effect any reorganisation until a Royal Commission has reported on the industry as a whole in the light of post-war conditions. The Committee declares that the Joint Electricity Authority has produced no evidence to substantiate the merits of the enormous merger contemplated from the standpoint of practical politics and that the proposed London Electricity Board is undemocratic. Even if some reorganisation of the inner, or greater London, area is necessary, there is no case at all for the inclusion of Guildford and many other non-suburban districts. The proposed London Electricity Board cannot at the same time maintain a real democratic constitution and be administratively efficient.

The proposal to attain uniformity of tariffs and charges throughout the district of the

London Electricity Board within two years of the commencement of the scheme would produce very great dissatisfaction in areas which have low prices and whatever expedient is ultimately adopted to obtain uniformity of charges, the actual accomplishment thereof should be a very gradual process over a considerable period of years.

Youth Training at Blackburn

Increased importance is now being given to training youths at Blackburn where the Corporation Electricity Committee, after receiving a report from Mr. R. H. Harral (engineer and manager), on training the department's engineering and technical staffs, has decided to collaborate in any scheme for apprentices or trainees. They are to be allowed to participate in part-time courses at Blackburn Technical College and will be permitted to visit Manchester, Preston or Burnley Colleges for subjects not covered locally. A technical reference library is to be inaugurated at Blackburn electricity offices for staff or employees in a private room where private study will be encouraged in the employees' own time.

Production Authorities Guide

To ensure the orderly planning of the production and allocation of manufactured products which are not obviously the concern of a single Government Department, Production Authorities have been established to assess requirements and see that capacity to meet them exists. The Ministry of Production has just issued a guide to these authorities (Stationery Office, 4d.). Among the less obvious entries it is noticed that "Lamps, electric, all kinds including civilian" fall within the scope of the Ministry of Aircraft Production (Controller of Communications Equipment); there is also an Interdepartmental Committee dealing with the subject.

Black-Light Mineral Detection

The value of so-called "black" light for detecting minerals which, by virtue of fluorescence or phosphorescence, become luminous when subjected to ultra-violet radiation is referred to in *Electrical News and Engineering*, which tabulates chemicals that are fluorescent and their exciting wavelength ranges together with types of "black" light lamps available in Canada. Illustrations include a lamp fixed over an inspection trough to assist the quick sorting of ores, as well as a portable battery-operated outfit for the use of prospectors examining ore bodies in mines.

Plans for School Kitchens

Plans for typical school kitchens and sculleries, prepared by the Ministry of Works in collaboration with the Board of Education, have just been issued to local education authorities. As announced by the President of the Board of Education on May 17th, when he called for the still more rapid extension of the school meals service, the Ministry of Works at the request of the local education authorities will supply completely equipped kitchens in accordance with these plans. It is proposed that wherever possible existing buildings should be used; new buildings will generally be fabricated.

Two main types of kitchen are planned—central kitchens, sending out meals in insulated containers to groups of schools, and canteen kitchens intended for erection in the grounds of the schools which they will serve. A combined central and canteen unit has also been designed. These kitchens may be operated by electricity, gas, steam or solid fuel, complete outfits of kitchen furniture and equipment being supplied by the Ministry. Among the items included in the list of equipment obtainable, which conforms with the M.O.W. Schedule of Cooking Equipment, are ranges, ovens, potato peelers, slicers, hotplates, mixers, boilers, refrigerators, water-heaters, dish-washing machines (3,000 pieces an hour), clocks and hot-cupboards. It is anticipated that there will be no delay in supplying the equipment, providing that orders are made in good time on the correct form and are properly authorised.

Maize as Boiler Fuel

Reporting upon its activities during 1942, the Cia. Italo-Argentina de Electricidad of Buenos Aires says that in compliance with the directions of the Argentine Government regarding the use of vegetable fuel, the burning of such fuel in the company's stations has been progressively increased.

In the "New Port" station two boilers were altered so as to burn pulverised cereals and two others were adapted to the burning of maize. For use in conjunction with the existing coal-handling plant, accessory handling, storage and pulverising equipment for vegetable fuel has been installed. This includes a reinforced concrete store capable of holding 2,000 tons of maize, a milling plant, a supply tower and a number of conveyors, as well as a new double-gauge railway siding.

At the "Pedro Mendoza" station the preliminary work for the installation of two "Velox" boilers is well advanced. For the purpose of burning pulverised cereals a further four Babcock & Wilcox boilers (making eight) have been adapted, and here, too, the handling plant has been augmented to deal with the new fuel.

Of the total of 390 million kWh generated by the company during 1942, 131 million kWh (over a third) was produced by means of vegetable fuel.

Change of Name

The Middlesex Electrical Co., Ltd., 15, Surrey Street, Lowestoft, has changed its name to the Chandos Engineering Co., Ltd.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

ELCON immersion heater.

ELECTRICITY SUPPLY

Canteen Maintenance. - Southwark's Women Employees.

Blackburn.—MILL SUPPLY.—The Corporation Electricity Department is affording a special supply of electricity to a mill at Gt. Harwood, and application is to be made for a loan to cover the cost of £1,100. The necessary switchgear is to be purchased from A. Reyrolle & Co., Ltd.

Enfield.—INSPECTION OF EQUIPMENT.—The U.D.C. Communal Feeding Committee has accepted the offer of the Northmet Power Co. to carry out monthly inspections of electrical equipment at canteens, followed by a brief report with any necessary recommendations. No charge is to be made for the inspection and any repairs will be charged for on the normal basis. The company states that to operate efficiently, steaming ovens should be de-furred at regular intervals.

Hull.—EXTENSIONS.—The Corporation Electricity Committee has obtained sanction to borrow £30,144 for extensions.

SUBSTATION EXTENSION.—Substation plant is to be extended at a cost of £2,116.

Lichfield.—SUPPLY TO FARMS.—The Corporation Electricity Committee is to provide supply to five farms belonging to the Staffordshire County Council at a cost of £630.

London.—SOUTHWARK.—The Borough Council Works Committee reports that some time ago it applied to the Ministry of Labour and National Service for women trainees for certain positions in the power station. A female assistant electrical draughtsman has taken up duties in the place of a male draughtsman who, for several months, has been loaned by the St. Marylebone Borough Council electricity undertaking. In addition, three female trainee electricians commenced work in May, as domestic apparatus repairers. They will be transferred to electrician's work within a further month. The rate of pay for these women is at the rate of 90 per cent. of the appropriate rates for fully-trained males.

The Borough Council Health Committee is to provide a supply in connection with the proposed new X-ray equipment at the health centre, at a cost of £300.

ST. PANCRAS.—The Borough Council Electricity Committee has obtained sanction to borrow £1,315 for mains and £320 for a substation.

Middlesex.—X-RAY APPARATUS.—The County Health Committee is to provide X-ray apparatus at the Finchley chest clinic at a cost of £1,300.

Shipley (Yorks.).—SMALL DEFICIT.—The Electricity Committee has reported that there was a loss of £82 upon the undertaking during the past year. This is attributed to the higher price of coal and decreased consumption by domestic consumers.

Stirling.—ELECTRICITY DEFICIT.—It was reported to Stirling Town Council that the deficit on the electricity undertaking for the year to May 15th, 1943, amounted to £3,241 and that the deficit had been met from the reserve fund. A report was submitted by the burgh electrical engineer on results of the trading for the year, and he suggested the charges for lighting, motive power and heating be increased by 10 per cent. The Finance Committee, however, recommended that no further action be taken at present.

Tynemouth.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to provide supply to Mr. J. E. W. Reynolds, Fawden Line, Percy Main.

Overseas

Bulgaria.—UTILISING WASTE COAL.—Erection of large thermal power plant near a coalfield in order to use waste coal is part of the 1943 plan for the electrification of Bulgaria. This station will be constructed on the territory of the State coal mines at Pernik. A commission has already worked out details of the plan, which provides for a 50,000-HP steam turbine installation. Work on the station will begin this year, and Sofia and the north-west part of the country as far as Plovdiv will be served. Electrification in 1942 was satisfactory, eleven towns and 166 villages being supplied with electricity for the first time. A new hydraulic plant was brought into operation at Vimda.

Rumania.—INCREASED CHARGES.—Electricity charges in Rumania have recently been increased. For houses the rate has been raised from 16 to 21 lei per kWh; for public institutions from 15·50 to 20 lei; and for hospitals from 13 to 17 lei.

Belgium.—LOWER PRODUCTION.—A decrease in production has been admitted in the annual report of the Interbrabant Union Intercommunale des Centrales Electriques du Brabant. The report says that coal of poor quality has contributed to the decrease, and the growing scarcity of raw materials has added to the difficulties experienced.

Peru.—WATER-POWER PROJECT.—A *Reuter* message from Lima says that the Government proposes to create an industrial holding corporation with a capital of $30 million to develop projects now under construction. One of the projects is the Canon del Pato hydro-electric plant. It is believed that the new corporation will operate somewhat on the lines of the American Tennessee Valley Authority.

TRANSPORT

Glasgow.—YEAR'S WORKING.—The revenue of the Corporation's transport undertaking touched a new high level in all three sections—tramways, bus and subway—during the past financial year. Compared with the previous year the undertaking carried 38,000,000 more passengers, although 1,500,000 fewer miles were run by the vehicles. Revenue from tramways was £3,132,869, as compared with £2,985,318 in the previous year; from buses, £1,182,163, as against £1,107,493; and from the subway, £190,937, as against £175,457, making the total revenue, £4,505,969, as against £4,268,268. Working expenses and net revenue charges totalled £4,425,675, as compared with £3,999,735 in 1941-42. The total excess of revenue over expenditure for the year was £80,294, compared with £268,533 in 1941-42.

Salvaging Worn Parts

Nickel Electrodeposited on Steel

HEAVY coatings of electro-deposited nickel on steel are being increasingly employed in the building up of worn or under-sized parts. In the *Production and Engineering Bulletin* (published by the Ministries of Production and Labour) it is stated that the strength of adhesion is such that tensile tests show fracture in the weaker metal and not at the boundary, although the fatigue strength of the repaired part may be less than its original value. The area of deposition can be confined to the portion that is under size, adjacent surfaces being "stopped off" usually by means of a special wax. In this way plain, concave and convex surfaces, both internal and external, can be built up to a size that leaves a stated margin for machining.

Preliminary mechanical roughening is a disadvantage, but worn surfaces that have become glazed should be machined or etched. The surface is preferably left for repair in a fine-machined or ground state with all burrs and sharp edges rounded off and scores and tool marks blended into the surface. Oil paint is objectionable as an indication of the portion to be repaired, as it is difficult to remove.

The Brinell hardness number of electro-deposited nickel can be varied within limits (in practice usually from 150 to 400) by adjusting the conditions of deposition. Its tensile strength varies with hardness from 30 to 70 tons per sq. in. and its ductility, inversely, from 30 to 6 per cent. or less. Most firms offer one type of deposit with a hardness number between 200 and 300. Such differences in hardness, however, are not usually of material importance, as nickel rapidly work-hardens under sliding action and the wear resistance of deposits tends to become similar. For surfaces subject to heavy pressure or local hammering, however, a hard deposit should be specified.

The time taken and the difficulties of deposition increase with thickness and generally 0·05 to 0·10 in. is the economical maximum. Although 0·005 in. ± 0·001 in. can be deposited on simple shapes, such as cylindrical shafts, it is generally better to apply a thicker deposit and machine to size.

Two factors bearing on the ease of treatment are accessibility of the surface to the depositing current and the weight and convenience of handling of the part. Surfaces having sharp edges or angles or in recesses build up less uniformly than those that are flat or cylindrical. The relative ease of applying a deposit to articles of different contour is in general controlled by the "throwing power" of the process, which is a measure of approach to uniformity of thickness of coating on an area of irregular shape.

Stainless steels and high-speed steels can be built up by special methods and some of the iron and brass alloys and most yellow metals can be successfully treated. Steel parts, unless very flimsy, are not distorted by nickel deposition, the maximum temperature used being only 400 deg. F. (and so unlikely to affect the temper) or even 200 deg. F.

Any indication of non-adherent or cracked nickel is a sign of bad workmanship. A very much higher standard of technical knowledge and control is necessary in applying heavy deposits than in ordinary electro-plating. Work should, therefore, be entrusted only to experienced firms. The Armament Research Department (S.M.R.), University College, Swansea, will on request provide a list of approved firms and will also give advice on the general subject in relation to Government contracts.

Alloy Steel Conservation

A NEW Direction has been issued by the Controller of Iron and Steel to all alloy steel ingot makers. It is obtainable from the British Standards Institution (price 6d. per copy, six copies or more 3d. each), 28, Victoria Street, Westminster, S.W.1.

The object of the Direction is primarily alloy conservation. The main reason for this is the enormous increase in the demand for alloy steel which means that available supplies of alloying elements now have to be spread over a bigger tonnage of steel.

Whilst the effect of this Direction is to limit the number of compositions available, the permitted compositions chosen are for the most part not new. For simplification the basis of the new Direction, like that of the old, consists of a table showing which steels are permitted for any given range of tensile strength and size. A considerable amount of work has gone into this table which shows the steels of the most economical alloy content which will give the desired properties, but obviously maximum alloy economy will not be achieved unless users take care not to call for physical properties in excess of the minimum which will give satisfactory service. The same remarks apply to size.

Among the permitted steels is a new specification En. 100 which is a low nickel-chrome-molybdenum steel which should be used to the fullest extent as this can be made entirely from scrap and is, therefore, particularly economical in alloy usage. The Direction is restrictive only in respect of alloy steels as it is hoped that both steelmakers and users will exploit carbon steels to the fullest possible extent.

Attention is drawn to two other new specifications, *i.e.*, En. 101 and 102. These are carbon manganese steels containing no critical alloys, so are not covered by the Direction and may be used freely. They are steels having physical properties for which alloy steel has generally been used hitherto and should find a wide application.

With regard to the General Sanction relating to steel for tools, if the physical requirements can be measured in terms of tensile strength, etc., even though the use to which the steel is to be put can be described as a tool, it is expected that the appropriate permitted steel will be chosen.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

W. T. Henley's Telegraph Works Co., Ltd.—In his speech at the annual meeting last Friday, Sir Montague Hughman (chairman) referred to the remarkable growth in the company's business during the last ten years. The year 1942 was a period of hard and anxious toil but they had carried out an increasing volume of work. He made special reference to the activities of the research and technical departments in connection with the raw material situation and to the company's encouragement of education of the youths entering its service. Low-priced meals were being provided in the company's canteens and it had been arranged that all workers under 18 could obtain meals at half price.

Sir Montague said that all the company's subsidiaries had operated at a profit during the year. The contract department had been busier than for many years; work had been carried out on 350 sites throughout the country and it had been well done in spite of labour and material difficulties.

Work which they had done in the national interest had meant a sacrifice of business which they formerly had with many home and overseas customers but they hoped to retain the goodwill of those friends. There had been a fall in export turnover but the company's branches abroad were being maintained and would be ready, when conditions permitted, to get their full share of the business which it was hoped would be available after the war.

The home trade had been satisfactory and production had been maintained at a high level. The efficiency of the works had been kept as high as possible but naturally, after four years of war, maintenance costs had increased.

Mr. W. F. Bishop, who recently retired from the position of general manager, also referred to the difficult raw-materials position and said that difficulties had been overcome by the organisation of the cable industry in this country both from the production and technical points of view. By co-operation between themselves, the service departments and the controllers many problems had been solved by the use of substitutes or by alternative methods of production and design.

John Thompson Engineering Co., Ltd.—Presiding at the annual meeting on July 1st, Col. S. J. Thompson said that the net profit for the group for the year (before taxation) showed a small decrease as compared with the previous year, although the turnover was considerably higher. The increased cost of labour and materials and higher expenses had decreased the margin of profit. During the year a staff pension scheme had been inaugurated. All of their fifteen subsidiary companies (which include John Thompson Water Tube Boilers, Ltd., and John Thompson (Wilson Boilers), Ltd.) had had a successful year's trading.

Callender's Cable & Construction Co., Ltd., reports earnings for 1942, after providing for taxation, and including income from investments, of £564,042, an increase of £139,084, as compared with the preceding year. From this are deducted depreciation (£80,000), directors' fees (£21,488) and debenture interest (£11,523), leaving a net profit of £451,031, an increase of £137,659. From the profit £30,000 is required for premium on redemption of debenture stock. The whole of the £300,000 4½ per cent. debenture stock was redeemed during the year at 110 with the exception of £935 outstanding in the names of stockholders abroad. The ordinary dividend for the year is maintained at 15 per cent., but this year an additional cash bonus of 5 per cent. is paid, making 20 per cent., less tax, for the year. It is proposed to place £50,000 to reserve for equalisation of dividends or for war contingencies, and £50,000 to workpeople's amenities fund. The balance carried forward is raised by £40,248 to £306,552.

The Chloride Electrical Storage Co., Ltd., reports a profit for the year ended March 31st of £519,806 as compared with £437,071 for 1941-42. From this are deducted directors' fees £5,000, and provision for income tax £225,000, and after adding £111,477 brought in, the balance available is £401,283. It is proposed to place £26,000 to employees' pensions and benefit funds, £20,000 to the proposed fund for pensions for employees of subsidiaries, and £25,000 to general reserve. As already announced, the final dividend on the "A" and "B" ordinary stock is 5 per cent., plus a bonus of 5 per cent., again making 15 per cent. for the year and the balance carried forward is £163,258. The report states that a profit of £22,267 has been realised during the year on the sale of investments, and this has been applied to write down investments in subsidiary companies.

Veritys, Ltd., report a profit for 1942 of £59,316 as compared with £52,590 for the preceding year. After providing for war risks insurance (£8,293), war damage contribution (£1,628), tax (£26,000), A.R.P. expenditure (£1,751), special depreciation of works installation, etc. (£2,500), and war contingencies reserve (£10,000), it is proposed to pay a dividend for the year of 7½ per cent. (same) and to carry forward £6,941 (against £4,547 brought in).

The Electric Construction Co., Ltd., earned a net profit for the year to March 31st of £118,201 as compared with £97,966 for 1941-42, to which is added £32,689 brought in, making £150,890 available. After providing £80,000 for taxation, it is proposed to pay an ordinary dividend for the year of 12½ per cent. (against 10 per cent.), to place £15,000 to general reserve, and to carry forward £33,640.

The British Thermostat Co., Ltd., states that the profit for the year ended January 31st last was £34,754 (against £29,847) after providing for depreciation. A sum of £5,000 is put to an obsolescence reserve to be used in connection with a post-war claim against the Inland Revenue authorities. As already reported, the dividend is maintained at 18½ per cent. by a final distribution of 11 per cent. A balance of £15,783 (against £13,779) is carried forward.

J. Stone & Co., Ltd., report a trading profit for 1942, after deducting taxation, of £596,762, and the net profit, after allowances for depreciation, etc., and A.R.P., was £232,126, as compared with £214,109 for 1941, to which is added £276,415 brought in. The ordinary dividend for the year is maintained at 25 per cent. and the balance carried forward is £319,441.

The Palestine Electric Corporation, Ltd., reports that after providing £155,000 for taxation, the net profit for 1942 is £132,785, as compared with £100,824 for 1941. It is proposed to pay a dividend of 5 per cent., tax free, on the ordinary and "A" ordinary shares. Dividend payments were resumed after a lapse of two years by the distribution of 4 per cent., tax free, for 1941.

The Morgan Crucible Co., Ltd., reports a net profit for the year ended March 31st of £786,968, as compared with £625,608 for the previous year, but after providing £623,800 for taxation, the balance available is £163,168. The ordinary dividend is maintained at 10 per cent. for the year, and the balance carried forward is £1,059 (against £266 brought in).

The British Vacuum Cleaner & Engineering Co., Ltd., reports a net profit for the year to September 30th last of £95,888, as compared with £49,697 for the preceding six months. The final ordinary dividend is 17½ per cent., making 30 per cent. for the year (against 15 per cent. for six months). For the eighteen months to March 31st, 1941, the distribution was 10 per cent.

The South Wales Power Station Co.—The *Financial Times* reports that £1,000,000 of 3½ per cent. first mortgage debenture stock 1958-68 of the South Wales Power Station Co., a member of the Edmundsons Group, has been bought by Lazard Bros. & Co., and is being placed privately at par.

The Telephone Manufacturing Co., Ltd., announces a net profit of £334,278 for 1942 (against £173,902). Income tax and E.P.T. absorb £303,556 (against £134,867) and £12,218 (against £20,067) is transferred to general reserve. The dividend for the year is maintained at 9 per cent.

The East London Rubber Co., Ltd., reports an increase in net profit from £114,199 for 1941-42 to £136,432 for 1942-43. The ordinary dividend is raised from 7½ to 10 per cent. It is proposed to change the company's name to "Kerry's (Great Britain), Ltd."

The Anglo-Portuguese Telephone Co., Ltd., has announced a final dividend of 5 per cent. on the ordinary stock, making 8 per cent. for the year, and a dividend of 8 per cent. on the "A" ordinary shares (both unchanged).

Christy Bros. & Co., Ltd., are again paying a first and final dividend of 12½ per cent.

Hick Hargreaves & Co., Ltd., have declared a final dividend of 8 per cent., making 10 per cent. for the year (same).

Taylor, Tunnicliff (Electrical Industries), Ltd., have announced an unchanged interim dividend of 2½ per cent.

The Kalgoorlie Electric Light & Power Co., Ltd., is paying a dividend of 5 per cent. (same) for the past year.

The Harland Engineering Co., Ltd., is raising its ordinary dividend from 4 to 5 per cent. for the past year.

International Combustion, Ltd., is again paying an interim dividend of 5 per cent.

New Companies

Universal Charging and Radio Service, Ltd.—Private company. Registered June 21st. Capital, £300. Objects: To acquire the businesses of radio engineers carried on by (1) E. Van Win at 161, Wardour Street, W., and (2) J. W. Hunt and J. G. Prior, at 238, High Street, Poplar. Directors: E. Van Win, 54, Ruislip Court, Ruislip; J. W. Hunt, 62, Berkeley Road, Hillingdon; and J. G. Prior, 24, Glenfield Road, Brockham, Surrey. Registered office: 161, Wardour Street, W.1.

B. Rome, Ltd.—Private company. Registered June 22nd. Capital, £100. Objects: To carry on the business of manufacturers and repairers of, and dealers in, dynamos, motors, armatures, batteries, magnetos, insulating materials, and electrical supplies generally, vehicles and accessories, etc. B. Rome, 88, Kinloch Drive, N.W.9, is a permanent director. Registered office: 75-77, Shaftesbury Avenue, W.1.

Accrometer Manufacturing Co., Ltd.—Private company. Registered June 22nd. Capital, £3,000. Objects: To acquire any patents and rights relating to electricity and electrical apparatus, and to carry on the business of electrical, mechanical and general engineers, toolmakers, etc. Subscribers: Mrs. D. O. Pike, Park Mansions, S.E.26; and Mrs. M. R. Robson, 101, Sydenham Park Road, S.E.26. L. Morris is permanent managing director and chairman. Solicitors: Billinghurst Wood & Pope, E.C.4.

Ralph Lewis & Co., Ltd.—Private company. Registered June 19th. Capital, £2,000. Objects: To carry on the business of manufacturers of, and dealers in, electrical and radio accessories and instruments, etc. Directors: R. Lewis and Mrs. M. Lewis, both of 857, White House, Albany Street, N.W.1. Registered office: 150, Charing Cross Road, W.C.2.

Mortgages and Charges

Arthur Lyon & Co. (Engineers), Ltd.—Assignment dated June 8th, to secure all moneys due or to become due from the company to Martins Bank, Ltd., charged on all moneys due or to become due to the company under certain contracts.

B. & H. (Nottingham), Ltd.—Mortgage on moneys referred to in two contracts, dated June 16th, to secure all moneys due or to become due from the company to Westminster Bank, Ltd.

Bankruptcies

A. H. Latham and R. C. Plant (Latham & Plant), wireless and electrical dealers, 35, Lowlands Road, Harrow, Middlesex.—Discharge suspended for three months until September 1st, 1943.

STOCKS AND SHARES

TUESDAY EVENING.

HOLIDAYS at home remove one of the principal elements which in pre-war days exercised a decided effect upon Stock Exchange markets and prices of securities. As July advanced, the interest of the public in matters of investment and speculation steadily waned, with the result that at this time of year, Stock Exchange business became reduced ordinarily to a bread-and-butter affair, with no special trend one way or the other. This year, however, interest in stocks and shares is maintained in a manner which serves to provide the markets with a reasonable amount of activity. The favourable progress of the war tends rather to restrain money from employment in purely gilt-edged stocks, and to divert it into the ordinary shares of industrial companies, particularly, of course, those with promising post-war prospects. Comparison of to-day's prices with those ruling at the beginning of the year shows that, except in the gilt-edged markets, the course of values has been mainly upward. British Government and similar securities have declined to a slight extent since last January.

"Cables" and Dollar Stocks

Since the declaration of the dividend upon Cable & Wireless ordinary stock, public interest seems to have evaporated from the market. In such circumstances, the usual result is a sagging of the price and this is the experience of to-day. The stock has lost 1½ points at 75½, comparing with 86 (cum £2 net dividend), at which the price stood on the eve of the announcement. The 5½ per cent. preference stock is 10s. better at 112, but the fall in the ordinary induced a sympathetic decline of 1s. to 34s. in Globe Telegraph & Trust ordinary shares. International "Tel. & Tel." are ½ higher at 17. Amongst other dollar stocks, Brazilian Tractions reacted to 32¼, speculation turning away from them and towards more exciting shares in the South African markets. Brazilian Traction common shares are of "no par value," the absence of a nominal value being due, according to commonly-accepted theory, to the escape from stamp duties which this plan permits.

Movements in Prices

Electric Constructions play the principal part on the moving stage of prices, the increase in dividend leading to a rise of 4s. 6d. This took the shares to 48s. 6d. cum dividend, at which the yield is £5 3s. on the money: a return that is good enough to hint at a possible further improvement in the price of the shares. Enfield Cable ordinary put on 1s., hardening to 55s. 6d. Automatic Telephones again gave way. Johnson & Phillips are 6d. lower at 69s. Westinghouse Brakes, 2s. 6d. down at 62s. 6d., now show a level 4 per cent. yield. Murex offer a similar return, having gone back to 5. Walsall Conduits eased off to 43s. 6d. Small advances occurred in Revo at 37s., British Vacuum, 24s. 9d., and Thorn Electrics, 21s. 6d. The radio group has been moderately active, with Electric & Musical Industries better at 24s. No alterations are to be recorded in the Home electricity supply list, but, remarked a dealer in the shares as he pointed to a selection of what is now available, "You can see for yourself that we can fit you up with a pretty good choice."

Equipment & Manufacturing

Callender's Cable & Construction Co. produced excellent figures in respect of last year, the profits rising £139,000 to £564,000. The amount of taxation is not stated, but the balance available for disposal is £128,000 up, at £451,000. The increased dividend declared, making 20 per cent. for the year, is earned with a large margin to spare. During the company's year, £300,000 debenture stock has been paid off. The current assets are still over £1,000,000. At 92s. 9d. ex dividend the yield is £4 6s. 2d. per cent., which compares with £4 2s. 2d. offered by Henley's at 24s. 3d. and £3 17s. 6d. by British Insulated at 5 3/16. General Electric ordinary, it will be observed, give £3 19s. 2d. at 88s. 6d. If the dividend now accrued in the price of these shares is taken into account, the yield will be slightly over 4 per cent. on the money, assuming that the company repeats the 17½ per cent. dividend paid in each of the past two years. Some people, as already mentioned, are looking for a modest increase. The announcement should be made about the middle of the current month.

Dividend Expansion

The Electric Construction Co.'s increase in dividend from 10 per cent. to 12½ per cent. came in the nature of a pleasant surprise. That the company has been doing well was generally known, but anticipation looked for the dividend to be retained at 10 per cent. under present conditions. For the four years 1931–1934, inclusive, the company paid no dividend on its ordinary shares, but the 3½ per cent. distributed in 1935 was doubled a year later, after which the dividend became 10 per cent. annually, with, in 1938, a bonus of 2½ per cent., and in 1939 a bonus of 3½ per cent.

British Vacuum Cleaner & Engineering 5s. shares hardened to 25s. upon announcement of a dividend making 30 per cent. for last year. This is double the previous year's

(*Continued on page* 61)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend Previous	Dividend Last	Middle Price July 5	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	56/6	..	4 6 10
British Power and Light	6	7	31/–	..	4 10 4
City of London	7	7	29/6	..	4 15 0
Clyde Valley	8	8	39/–	..	4 2 0
County of London	8	8	39/–	..	4 2 0
Edmundson's:					
7% Pref.	7	7	34/–xd	+3d.	4 2 4
Ord.	6	6	28/6	..	4 4 3
Elec.Dis.Yorkshire	9	9	44/6	..	4 1 0
Elec. Fin. and Securities	12½	12½	52/–	..	4 16 1
Elec. Supply Corporation	10	10	46/–	..	4 7 0
Isle of Thanet	2	Nil	17/–	..	—
Lancs. Light and Power	7½	7½	34/6	..	4 7 0
Llanelly Elec.	5½	6	26/–	..	4 12 4
Lond.Assoc.Electric	4	3	22/–	..	2 14 10
London Electric	6	6	26/6	..	4 10 7
London Power Red. Deb.	5	5	104½	..	4 15 7
Metropolitan E.S.	8	8	39/–	..	4 2 2
Midland Counties	8	8	38/–	..	4 4 2
Mid. Elec. Power	9	9	42/6	..	4 4 9
Newcastle Elec.	7	7	31/–	..	4 10 5
North Eastern Elec. Ordinary	7	7	32/–	..	4 7 6
7% Pref.	7	7	34/–	..	4 2 4
Northampton	10	10	47/6	..	4 4 0
Notting Hill 6% Pref. (£10)	6	Nil	10	..	—
Northmet Power:					
Ordinary	7	7	36/6	..	3 16 8
6% Pref.	6	6	31/–	..	3 17 5
Richmond Elec.	6	6	26/–	..	4 12 4
Scottish Power	8	8	37/6	..	4 5 4
Southern Areas	5	5	22/6	..	4 9 0
South London	7	7	26/–	..	5 7 8
West Devon	5	5	23/–	..	4 7 0
West Glos.	4½	3½	23/–	..	3 0 10
Yorkshire Elec.	8	8	39/6	..	4 1 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	5/6	..	—
Calcutta Elec.	7*	6*	38/–	..	3 3 0
Cawnpore Elec.	10	10	32/–	..	6 5 0
East African Power	7	7	32/6	..	4 6 2
Jerusalem Elec.	7	5	28/6	..	3 10 2
Kalgoorlie (10/–)	5	5*	9/–	..	5 11 1
Madras Elec.	6*	4*	24/6	..	—
Montreal Power	1½	1½	28½	..	5 5 5
Palestine Elec. "A"	4*	5*	43/3	..	2 6 3
Perak Hydro-elec.	6	7	9/–	..	—
Shawinigan Power	83cts.	90cts.	20	–¼	—
Tokyo Elec. 6%	6	6	20	..	—
Victoria Falls Power	15	15	4½xd	..	3 12 9
Whitehall Inv. Pref.	—	—	25/–	..	4 16 1

Company	Dividend Previous	Dividend Last	Middle Price July 5	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1955–60 (Civil Defence)	—	3	100	..	3 0 0
1955–75	5	5	115	..	4 7 0
1951–73	4½	4½	107	..	4 4 1
1963–93	3½	3½	103½	..	3 7 8
1974–94	3½	3½	101	..	3 3 9
London Elec. Trans. Ltd.	2½	2½	96½	..	2 11 10
London & Home Counties 1955–75	4½	4½	110xd	+1	4 1 10
Lond. Pass. Trans.:					
A	4½	4½	116½	..	3 17 3
B	5	5	115½	..	4 6 7
C	2½	3	61½	..	4 17 7
West Midlands J.E.A. 1948–68	5	5	110	..	4 11 0
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	112½	..	5 6 9
Def.	1½	1½	28	..	5 7 2
Anglo-Portuguese	8	8	24/–	..	6 13 4
Cable & Wireless:					
5½ Pref.	5½	5½	112	+½	4 18 0
Ord.	4	4	75½	–2	5 7 4
Canadian Marconi $1	Nil	4cts.	10/6	..	—
Globe Tel. & Tel.:					
Ord.	8¼*	5*	34/–	–1/–	2 18 10
Pref.	6	6	28/9	..	4 3 6
Great Northern Tel. (£10)	Nil	Nil	24	..	—
Inter. Tel. & Tel.	Nil	Nil	17	+½	—
Marconi-Marine	7½	7½	33/–	..	4 11 0
Oriental Tel. Ord.	16	10	41/9	..	—
Telephone Props.	6	Nil	13/9	..	—
Tele. Rentals (5/–)	10	10	11/–	..	4 11 0
Traction and Transport					
Anglo-Arg. Trans.:					
First Pref. (£5)	Nil	Nil	4/6	..	—
4% Inc.	Nil	Nil	11	..	—
Brit. Elec. Traction:					
Def. Ord.	45	45	1075	..	4 3 9
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	10	10	50/–	..	4 0 0
Brazil Traction	$½	$1	32½	–¾	—
Calcutta Trams.	8	5½	43/9	..	2 10 3
Cape Elec. Trams	5	6	25/6	..	4 14 0
Lancs. Transport	10	10	44/3	..	4 10 4
Mexican Light:					
1st Bonds	5	5	107½xd	+1¼	4 13 0
Rio 5% Bonds	5	5	104½	..	4 15 9
Southern Rly.:					
5% Prefd.	5	5	76	+1	6 11 7
5% Pref.	5	5	111½	..	4 9 8
T. Tilling	10	10	54/–	..	3 14 0
West Riding	10	10	43/6	..	4 12 0

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price July 5	Rise or Fall	Yield p.c. £ s. d.
Equipment and Manufacturing					
Aron Elec. Ord...	7½	10	41/3	..	4 17 0
Assoc. Elec.:					
Ord.	10	10	48/6	..	4 2 2
Pref.	8	8	39/–	..	4 2 2
AutomaticTel.&Tel.	12½	12½	56/–	–1/–	4 9 3
Babcock & Wilcox	11	11	48/–	..	4 11 7
British Aluminium	10	10	48/6	..	4 2 6
British Insul. Ord.	20	20	5⅛	..	3 17 6
British Thermostat (5/–)	18½	18½	17/6	..	5 5 9
British Vac.Cleaner (5/–)	15	30	25/–	+9d.	6 0 0
Brush Ord. (5/–)	6	8	8/–	..	5 0 0
Burco (5/–) ..	15	15	14/3	..	5 5 1
Callender's ..	15	20	92/9	–9d.	4 6 2
ChlorideElec.Storage	15	15	82/6xd	..	3 12 8
Cole, E. K. (5/–)	7	10	23/–	..	2 3 6
Consolidated Signal	17	24	5⅞	..	4 8 3
Cossor, A. C. (5/–)	15	10*	22/–	+1/–	1 14 1
Crabtree (10/–) ..	17½	17½	38/–	..	4 12 4
Crompton Parkinson Ord. (5/–) ..	20	20	25/–	..	4 0 0
E.M.I. (10/–) ..	6	6	24/–	+6d.	2 10 0
Elec. Construction	10	12½	48/6	+4/6	5 3 1
Enfield Cable Ord.	12½	12½	55/6	+1/–	4 10 1
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric	10	10	48/–	..	4 3 4
Ensign Lamps(5/–)	25	25	21/3	..	5 17 8
Ericsson Tel.(5/–)	22†	20†	47/6	..	2 2 2
Ever Ready (5/–)	40	40	37/6	..	5 6 8
Falk Stadelmann	7½	7½	31/–	..	4 16 9
Ferranti Pref. ..	7	7	28/9	..	4 17 5
G.E.C.: Pref. ..	6½	6½	33/–	..	3 18 9
,, Ord. ..	17½	17½	88/6	..	3 19 2
Greenwood&Batley	15	15	40/–	..	7 10 0
HallTelephone(10/–)	12½	12½	25/3	..	4 19 0
Henley's (5/–) ..	20	20	24/3	..	4 2 2
4½% Pref. ..	4½	4½	23/–	..	3 18 3
Hopkinsons ..	15	17½	63/9	..	5 9 9
India Rubber Pref.	5½	5½	21/–	..	5 4 9
Intl. Combustion	30	30	6¼	..	4 17 10
Johnson & Phillips	15	15	69/–	–6d.	4 7 2
LancashireDynamo	20	22½	91/3	..	4 18 9
Laurence,Scott(5/–)	15	12½	12/–	..	5 4 2
London Elec. Wire	7½	7½	31/6	..	4 15 3
Mather & Platt	10	10	48/9	..	4 2 0
Met.Elec.CablePref.	5½	5½	21/3	..	5 3 6
Murex	20	20	5	–¼	4 0 0
Pye Deferred (5/–)	25	25	22/6	..	5 11 1
Revo (10/–) ..	17½	17½	37/–	+6d.	4 14 7
Reyrolle	12½	12½	67/6	..	3 14 0
Siemens Ord. ..	7½	7½	30/–	..	5 0 0
Strand Elec. (5/–)	4	7½	7/6	..	5 0 0
Switchgear & Cowans (5/–) ..	10	20	15/6	..	6 9 0
T.C.C. (10/–) ..	5	5	16/3	..	3 1 7
T.C. & M. ..	10	10	51/–	+1/–	3 18 7
TelephoneMfg.(5/–)	9	9	11/9xd	..	3 16 7
Thorn Elec. (5/–)	20	20	21/6	+3d.	4 13 1
Tube Investments	20	20	91/6	..	4 7 4
Vactric (5/–) ..	Nil	Nil	12/6	..	—
Vickers (10/–) ..	10	10	18/9	..	5 6 8
WalsallConduits(4/–)	55	55	43/6	–6d.	5 1 2
Ward & Goldstone (5/–)	20	20	22/6	..	4 9 0
WestinghouseBrake	10	12½	62/6	–½	4 0 0
West, Allen (5/–)	7½	7½	7/6	..	5 0 0

* 5 per cent. tax-free. † Dividends free of Income Tax.

Stocks and Shares (*Continued from page* 59)

dividend. An increase had been expected, but the improvement is better than had been looked for. The A. C. Cossor report is said to be on the point of publication. The present price of the shares, 22s., clearly implies that satisfactory results are looked for.

Palestine Electrics

Confidence that the Palestine Electric Corporation would increase its dividend in the near future has been mentioned here more than once, and the company has now fulfilled anticipation by declaring a dividend of 5 per cent., free of tax, on its ordinary and "A" ordinary shares for 1942, as against 4 per cent., tax free, in 1941. For the two years previous to 1941, nothing was paid, and the price of the shares fell to 17s. The present price is 43s. 6d., at which the return on the money on the new 5 per cent. dividend rate works out at £2 6s. 3d. per cent., free of tax.

For the improvement in the company's fortunes the military developments in Egypt are, of course, responsible; and, with the enemy cleared out of that part of the world, the company should be able to make strides towards regaining its past prosperity. For the years 1934 to 1937 inclusive, the annual dividend was 7½ per cent., free of tax. That the Jerusalem Electric is expected to follow the Palestine Company's lead the relatively high price of the shares, 28s. 6d., testifies. It is thought that before long the Jerusalem Electric will revert to the 7 per cent. dividend paid in pre-war days.

Anglo-Portuguese Telephone

Anglo-Portuguese Telephones shares are unchanged at 24s. upon declaration of a final dividend making 8 per cent. for 1942. At the present price, the yield on the money is £6 13s. 4d., a return which, were it not for the geographical position of the company, would invite investment of money into shares which have received so consistently a good dividend each year. Besides ordinary shares, there is also £100,000 in "A" ordinary shares, these being held by the Telephone & General Trust. The ordinary stock totals £1,199,375.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

AKT.-GES. Brown, Boveri & Cie.—"Rectifiers." 4971/42. April 28th, 1941. (554061.) "Method and device for cooling combustion chambers particularly for gas turbines or the like." 10319/42. July 12th, 1941. (554112.)

Automatic Telephone & Electric Co., Ltd., and R. N. Saxby.—"Valve arrangements for controlling fluids." 15981. December 11th, 1941. (554016.)

R. C. Braithwaite, E. G. Holme and Metropolitan-Vickers Electrical Co., Ltd.—"Pivotal bearings." 16124. December 13th, 1941. (554044.)

British Insulated Cables, Ltd., and J. Chesworth.—"Joints for electric cables." 16790. December 30th, 1941. (554020.)

British Mechanical Production, Ltd., and S. T. Deakin.—"Snap-action electric switches." 17517/40. December 10th, 1941. (553980.)

British Thomson-Houston Co., Ltd.—"Electric current converting systems." 16477/41. December 24th, 1940. (554018.) "Washing machines." 301/42. January 9th, 1941. (554022.) "Shaft packing arrangements." 16476/41. December 24th, 1940. (554078.) "Contact arrangements for electric switches." 2454/42. February 25th, 1941. (554086.)

British Thomson-Houston Co., Ltd., and B. Adkins.—"Control alternating current electric motors." 15. January 1st, 1942. (554079.)

A. C. Denisoff and B. P. Scanlan.—"Electric resistance elements, more particularly of resistance thermometers." 15918. December 10th, 1941. (553995.)

Kolster-Brandes, Ltd., D. N. Corfield, A. B. Atkinson and R. W. Cundy.—"Electric soldering irons." 16048. December 12th, 1941. (554041.)

Londex, Ltd., and W. S. F. Brown.—"Process timer and the like devices." 3755. March 20th, 1942. (554050.)

Philco Radio & Television Corporation.—"Radio-phonograph employing a photo-electric pick-up." 16059/41. December 13th, 1940. (554043.)

Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken).—"Lead-through conductors for electric discharge tubes." 1842. February 11th, 1942. (554004.) "Optical systems comprising a correction element." 378. January 9th, 1942. (554024.)

J. H. Reyner, and F. R. Milson.—"Pulse generating circuit." 1512. February 5th, 1942. (554003.)

Standard Telephones & Cables, Ltd.—"Telephone ringers." 4073/42. October 22nd, 1940. (554056.) "Telephone systems." 9605/42. April 12th, 1941. (554091.) "Electric wave transmission network." 9607/42. August 23rd, 1941. (554092.) "Coils for relays and inductive apparatus." 10733/42. August 28th, 1941. (554114.) "Electric wave transmission system regulation." Cognate applications 12511/42 and 12512/42. September 9th, 1941. (554117.) "Wire transmission systems for electric signals." 12513/42. September 9th, 1941. (554118.)

Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.).—"Electric multiplying cables." 4748. April 10th, 1942. (Convention date not granted). (554060.)

Standard Telephones & Cables, Ltd., and S. H. Towner.—"Vibratory relays." 16049. December 12th, 1941. (554042.)

Standard Telephones & Cables, Ltd., S. H. Towner and W. H. D. Yule.—"Alternating current relays." 16047. December 12th, 1941. (554040.)

Standard Telephones & Cables, Ltd., A. A. New, S. G. Foord and D. R. Beckwith.—"Electric insulating material." 14018. October 31st, 1941. (554097.)

F. L. Steghart.—"Multipoint recorder controller embodying an electrical amplifier." 2901. March 5th, 1942. (554030.)

W. Stern.—"Electric devices for controlling intermittent signals." 482. January 13th, 1942. (553998.)

Telegraph Construction & Maintenance Co., Ltd., and E. W. Smith.—"High frequency electric cables." 16183. December 15th, 1941. (Addition to 533982.) (554074.)

W. C. Trythall.—"Change-speed power transmission apparatus employing electric motors." 14641/41. November 13th, 1941. (554038.)

Western Electric Co., Inc.—"Systems for the electrical transmission of sounds." 13852/42. October 15th, 1941. (554119.)

Westinghouse Electric International Co.—"Magnetic core structures." 1192/42. January 29th, 1941. (554000.) "Gaseous electric discharge devices." 12270/42. October 23rd, 1941. (554116.)

Institute of Fuel Students' Medal

TO encourage the preparation of papers by students of fuel technology, the Council of the Institute of Fuel has decided to make an annual award of a medal, together with a prize consisting of books and/or instruments to the value of £5. The award will be made annually for a paper submitted by a student member of the Institute or by a student under 25 years of age of any university or technical college in the United Kingdom. Papers submitted for this competition must not exceed 6,000 words and should be addressed to the Secretary, Institute of Fuel, 30, Bramham Gardens, London, S.W.5.

Bolt and Nut Prices

Alterations in the present controlled maximum prices of certain types of bolts and nuts, are contained in a new order issued by the Minister of Supply. The price list has also been extended to cover some types of aircraft bolts and nuts.

Copies of the Order, The Control of Bolts, Nuts, Screws, Screw Studs, Washers and Rivets (No. 2) Order, 1943 (S.R. & O. 1943 No. 884), which came into force on July 1st, may be obtained from the Stationery Office, price 1d.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Birkenhead.—July 26th. Electricity Department—E.h.v. and l.v. switchgear and a 230-kW mercury arc rectifier (see this issue).

Newcastle-on-Tyne.—City Council.—Erection of a canteen at the Transport and Electricity Department, including the installation of electrical cooking equipment. Plans by H. C. Godsmark, general manager, Electricity and Transport Department.

Plymouth.—July 17th. Electricity Department.—Painting boiler house chimneys (see this issue).

Stockport.—Education Committee.—Electric lamps for various schools and centres. G. Holgate, director of education, Town Hall.

Orders Placed

Cardiff.—Electricity Committee. Accepted. Switchboard (£266).—Ferguson, Pailin.

London.—Metropolitan Water Board. Accepted. Cable for Hampton works (£68).—Aberdare Cables; two circuit breakers for Lee Bridge electric pumping plant (£243).—Crompton Parkinson.

Manchester.—Electricity Committee. Accepted. Equipment for Barton power station: Draught fan impellors for boilers.—J. Howden & Co. (Land); links for coal conveyors.—W. J. Jenkins & Co; spares for powdered fuel boiler.—Babcock & Wilcox.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashbourne.—156 workers' houses in Hartington, Brassington, etc., for R.D.C.; J. H. Wheeldon, surveyor, King Edward Street.

Bingham.—Houses (12), Bingham, Cropwell Bishop, Langar, and Orston, for R.D.C.; C. W. Kendrick, surveyor, Council Offices, Bingham, Nottingham.

Birmingham.—Police quarters, Thornhill Road (£12,000); city engineer.

Bolsover.—Catholic chapel, High Street, for Diocesan Board, Derby; priest-in-charge, Catholic Chapel.

Bournemouth.—Meals centre, Hill View Road (£610); Hawkins Bros.

Alterations, Royal Mews; Hants & Dorset Motor Service, Ltd.

Brighouse.—School clinic, Brook House, Atlas Mill Road, for T.C.; H. A. Sneezum, borough surveyor, Municipal Offices, Commercial Street.

Cardiff.—Improvements, Central Library; city engineer.

Fire station, Bute Street (£2,121); Rogers & Davies.

Caistor.—Parlour-type houses (30), several parishes, for R.D.C.; G. H. Earnshaw, surveyor, Council Offices, Caistor, Lincs.

Carlisle.—Adaptation of buildings as technical school (£780), for E.C.; P. Dalton, city surveyor, 18, Fisher Street.

Chesterfield.—School kitchen at Girls' High School, Sheffield Road, for Derbyshire Education Committee; J. Harrison, county architect, County Buildings, St. Mary's Gate, Derby.

201 houses at Halfway, Hackenthorpe, Stonebroom and Wessington, for R.D.C.; J. B. Wikeley, Rural Council House.

Chipping Norton.—Houses, Chadlington, Fifield, and Great Tew, for R.D.C.; T. Rayson, architect, 35, Beaumont Street, Oxford.

Clun.—Houses, Brockton and Eyton, for R.D.C.; H. T. Richardson, architect, Central Chambers, 15, Pride Hill, Shrewsbury.

Coventry.—Reinstatement of Dane Road school buildings, for E.C.; D. E. E. Gibson, city architect, 1a, Warwick Row.

Croydon.—Additions, Selhurst school (£1,300); borough engineer.

Canteens, Howard & Selhurst schools (£4,300); borough engineer.

Shelters (£3,123); W. Strong.

Driffield.—Houses, Bainton, Harpsham, Foston and Wansford, for R.D.C.; R. B. Tollett, clerk, Council Offices, West Garth, Driffield.

Derwent.—Houses at Kelfield, North Duffield and Wheldrake, for R.D.C.; J. Townend, clerk, 1, Abbey Place, Selby.

Droitwich.—Houses, Elmbridge, Himbleton and Ombersley, for R.D.C.; Pritchard, Godwin & Clist, architects, Bank Buildings, Kidderminster.

Droxford.—Houses (14), for R.D.C.; R. A. Thomas, architect, Cosham, Portsmouth.

Dundee.—Erection of huts at Harris Academy for Corporation; city quantity surveyor.

Easingwold.—Hostels for aged persons (joint scheme for R.D.C. and Flaxton R.D.C.); H. Osborne, clerk to the council, Council Offices.

Edinburgh.—Wartime nursery, Pleasance Trust, for T.C.; city architect, City Chambers.

Enfield.—Nursery, Baker Street (£2,482); Houslip & Co.

Faringdon.—Houses for agricultural workers, Ashbury and Uffington, for R.D.C.; K. M. Hart, surveyor, Council Offices, London Street, Berks.

Friern Barnet.—Offices; Dickinson & Clarke, Ltd.

Works additions; J. F. Allen & Son.

Frodsham.—British Restaurant, High Street,

for Runcorn R.D.C.; A. J. King, surveyor, Castle Park.

Hereford.—Canteen, transport station; Birmingham & Midland Omnibus Co., Ltd.

Hitchin (Herts).—Houses (12) for the Rural Council; F. J. Mold, Waltham Abbey.

Huyton.—New technical high school for Lancashire E.C.; L. Evans, county architect, County Buildings, Fishergate Hill, Preston.

Ilford.—Nursery, Becontree Avenue (£2,885); L. T. Best, Ltd.

Isle of Ely.—Extensions (£4,912), High School and Grammar School, March, for E.C.; R. D. Robson, county architect, County Hall, March.

Jarrow-on-Tyne.—Extension of Bede Burn School by use of prefabricated hut; borough engineer.

Kent.—River works; engineer, Maidstone Catchment Board.

Kidderminster.—New civic centre, for T.C.; J. Hawcroft, borough surveyor, Mill Street.

Leigh.—Central school kitchen, for T.C.; A. T. Clare, borough surveyor, Town Hall.

Liskeard.—Erection of fire station, for T.C.; borough engineer.

London.—HAMMERSMITH.—School huts, St. Clements Danes estate (£3,125); L.C.C. architect.

ST. PANCRAS.—Nursery, Peckwater Street (£3,808); Mattock & Parsons.

Manchester.—British Restaurant, Quay Street site, for T.C.; G. Noel Hill, city architect, Town Hall, Albert Square.

Restaurant, Stockport Road (£4,271); additions, Sharston school (£1,580); city engineer.

Middlesbrough.—Kitchens at the Beechwood, Whinney Banks, Brambles, and Marsh Road Schools, for the E.C.; education architect.

Newbury. — Agricultural workers' houses, Thatcham, Boxford, and Curridge, for R.D.C.; Clerk's Office, Phoenix House, Bartholomew Street.

Newcastle-on-Tyne.—Air raid shelters at various schools in the City; Mr. F. Harvey, Education Offices, Northumberland Road, Newcastle.

Newmarket.—Agricultural houses (12), for R.D.C.; H. H. Parker, 20, St. Andrew's Street, Cambridge.

Newton Heath.—Additions to Saw Mills, Oldham Road and Mount Street; W. Lionel Gray (1933), Ltd., builders, Hospital Road, Farnworth, near Bolton.

Northallerton (Yorks).—14 houses for agricultural workers; Kitching & Co., 40, Albert Road, Middlesbrough.

Northampton.—Additions, Phoenix Brewery, Bridge Street; Northampton Brewery Co., Ltd.

Oldham.—Day nursery, St. Paul's Ward, for T.C.; borough engineer, 75, Union Street.

Ossett.—Office and boiler house, Denholme Drive; H. Jubb.

Two bungalows, Manor Road; Boocock & Newbold.

Alterations, Ings Mill, Dale Street; Mr. James Denton.

Southgate.—Flats, 10 Woodland Road; H. Tanner.

South Shields.—Temporary Presbyterian Church, Prince Edward Road; F. W. Newby, architect, King Street.

Additions to school meals service; borough engineer.

Walton-le-Dale.—220 houses for U.D.C.; A. Wilkinson, surveyor, Council Offices.

Wellingborough.—85 houses, sites at Great Doddington, Earls Barton, Little Harrowden, etc., for R.D.C.; H. W. Sheffield, surveyor, 18, Oxford Street.

Overcoming Specular Glare

AN interesting example of industrial lighting redesigned on scientific principles is presented by the B.T.H. installation in a large aeroplane factory where specular reflections from bright surfaces had been exceptionally troublesome. Originally the drawing office had only one or two 100-W lamps in 8-in. conical shades overhead, giving a general illumination so inadequate that it had to be supplemented on every board by at least one adjustable arm bracket carrying a 60-W or 100-W lamp. The new installation provides over a hundred 80-W 5-ft. "Mazda" fluorescent lamps in "F.107" reflectors, spaced at 5 ft. 6 in. centres, at a mounting height of 9 ft. from floor level. This gives an average intensity on the drawing boards of 30 to 35 foot-candles. In the building which houses the main bays the intensity of the original illumination nowhere exceeded 3 foot-candles, and it had been necessary to use a great many portable lamps throughout the three bays. The new scheme was designed to give 18 foot-candles over the whole working plane; 1,000-W "Mazda" tungsten gas-filled lamps were installed in "C.70683" reflectors, spaced at 18-ft. centres and mounted 30 ft. above floor level. This provides a very even and satisfactory illumination, and similar results have been achieved in the machine shop.

Specular glare had been a persistent and annoying trouble in the view room, where the operations in progress consisted chiefly of inspection of small parts for aircraft. Gas-filled lamps in dispersive reflectors were replaced by twenty 80-W 5-ft. "Mazda" fluorescent lamps in "F.107" reflectors, spaced 6 ft. by 6 ft. and mounted 8 ft. from the floor. This now provides an even intensity of from 25 to 30 foot-candles and specular glare, which was extremely high before, has been practically eliminated. In the sewing room where glare was reflected from the sewing machines and bright aluminium parts which were being covered with fabric the new scheme comprises 500-W "Mazda" tungsten lamps in "Glassteel" diffuser fittings, spaced 10 ft. by 10 ft. at a mounting height of 10 ft. and provides an average intensity at the benches of 15 to 18 foot-candles. H. M. Speirs & Co., were responsible for the installation.